THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1415.] LONDON, JUNE 24, 1890. [42ND YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Guaranteed Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

Illustrated Price List Post Free.

TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 1214.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

J. UNGAR & CO.,
Manufacturers & Patentees of every Description of
IMPROVED LAMPS
FOR
Streets, Markets, Shops, &c.
WHOLESALE DEPOT: 52, COMMERCIAL ST., LONDON, E.
We specially solicit Government and Local Board Contracts for General Lighting.

FUEL ECONOMY.

MELDRUM'S PATENT FURNACES

RAISE STEAM BY BURNING

BREEZE, COAL DUST,

AND OTHER SMALL AND POOR FUEL.

Telegrams: "Meldrum Manchester."

REALIZED SAVING UP TO

Results Guaranteed.

£200

PER BOILER PER ANNUM.

MELDRUM BROTHERS,
26, HALF STREET, CATHEDRAL YARD, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

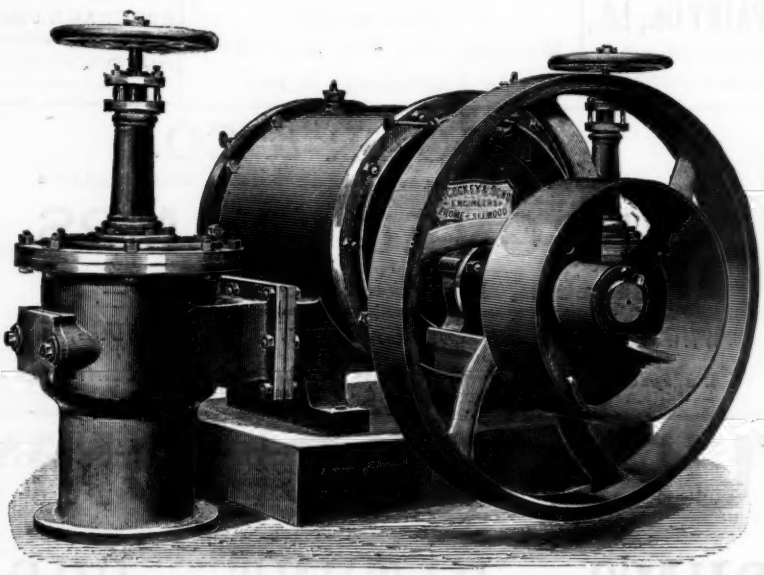
A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

Wood Grids for Purifiers and Scrubbers.

Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



Experienced Retort-Setters constantly employed.

Lead Burning and Plumbing in all its Branches.

Gas-Fittings in great variety.

Brass Castings.

Patent Washers and Valves.

Boilers and Engines.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

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MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

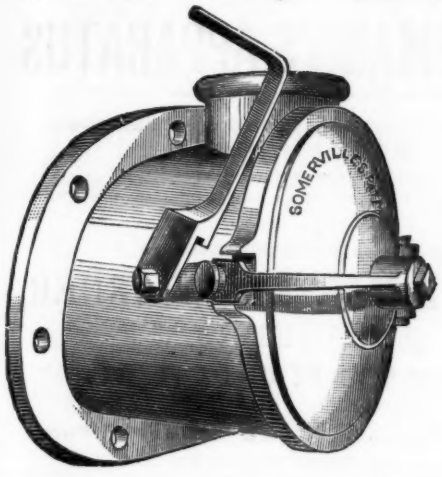
LONDON: 108, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO.,

(ESTABLISHED 1822)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF



GASHOLDERS AND GAS APPARATUS,

INCLUDING

RETORTS AND FITTINGS, PURIFIERS, VALVES, PIPING, SCRUBBERS, CONDENSERS, WASHERS, &c., &c., &c.;

GASHOLDER TANKS IN CAST AND WROUGHT IRON;

GOLIATH, HYDRAULIC, AND OTHER PURIFIER COVER LIFTS,

ALL OF THE MOST APPROVED DESIGNS.

BOILERS, ENGINES, PUMPS, EXHAUSTERS, METERS, GOVERNORS, &c.

SULPHATE OF AMMONIA PLANT.

MAKERS OF

SOMERVILLE'S PATENT RETORT MOUTHPIECES & LIDS,

WHICH ARE SELF-SEALING AND REQUIRE NO LUTING.

Prices and further Particulars may be obtained on application.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON

CONDENSERS, SCRUBBERS, & WASHERS,

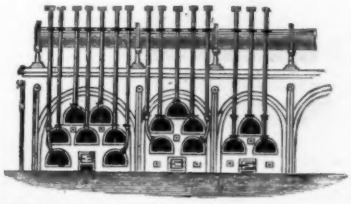
TAR AND LIQUOR PUMPS, &c.

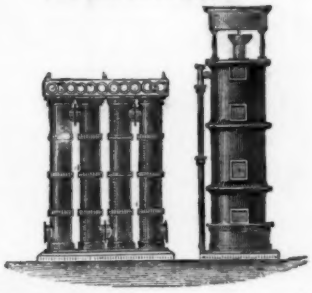
PATENT

CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.



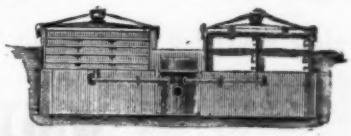


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.
MARK.	CLAY CROSS.	53, QUEEN VICTORIA ST., E.C.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

Patent Regenerative Retort-Settings.

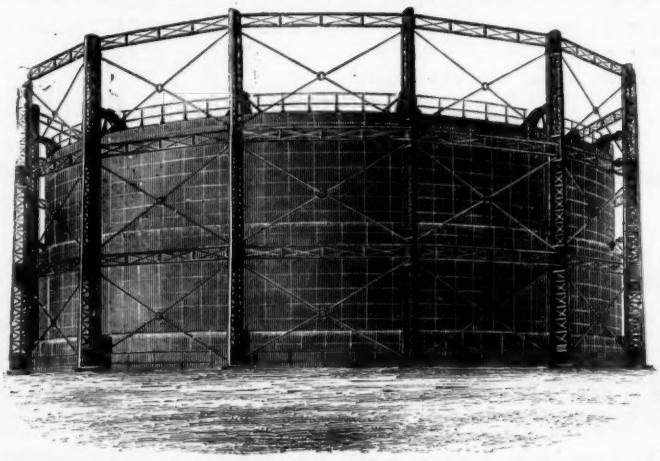
Patent Rotary Scrubber-Washer.

Patent Reciprocating Exhauster.

Patent Regulator.

Patent Anti-Dip Pipes.

Telegrams:
"Holmes Huddersfield."
"Ignitor London."



Treble-Lift Gasholder, 130 ft. by 66 ft., as erected at Burton-on-Trent, 1889.

SOLE MAKERS OF

DRAKE'S PATENT

GAS PLANT

Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED CHEMICAL PLANT.

Illustrated Catalogues on application.

WHITESTONE IRON-WORKS,

HUDDERSFIELD,

AND

80, CANNON STREET, LONDON, E.C.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS HUNSLET, LEEDS

LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A SPECIALTY OF GASHOLDERS

AND MAKERS OF GAS PLANT OF EVERY DESCRIPTION.

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, AND TILES OF EVERY DESCRIPTION.

GLAZED BRICKS AND PORCELAIN BATHS.

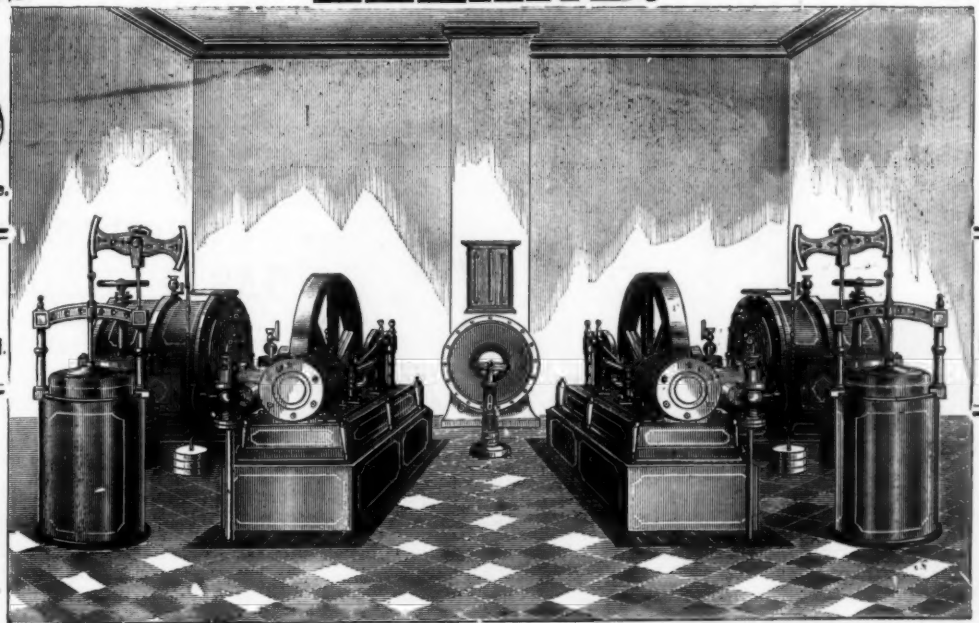
R. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS,

ELLAND.

No. 1. Flange Valve.



No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION.

NO HIGH SPEED.

STEADY GAUGE.

No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

CROSSLEY'S "OTTO" GAS-ENGINE.

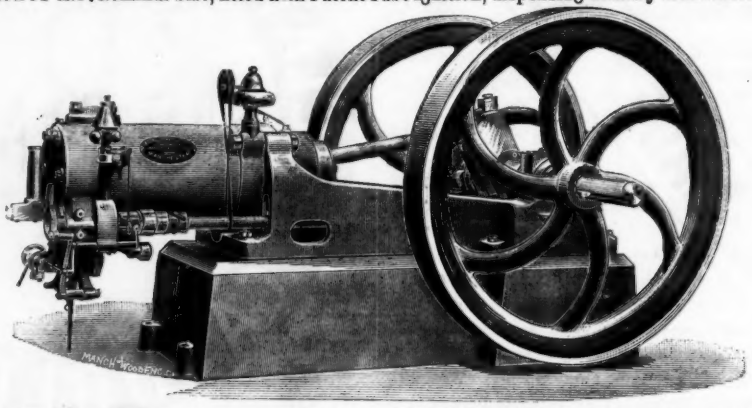
100 Prize Medals.

MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c. &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over 31,000 "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE,
BIRMINGHAM,
HULL.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

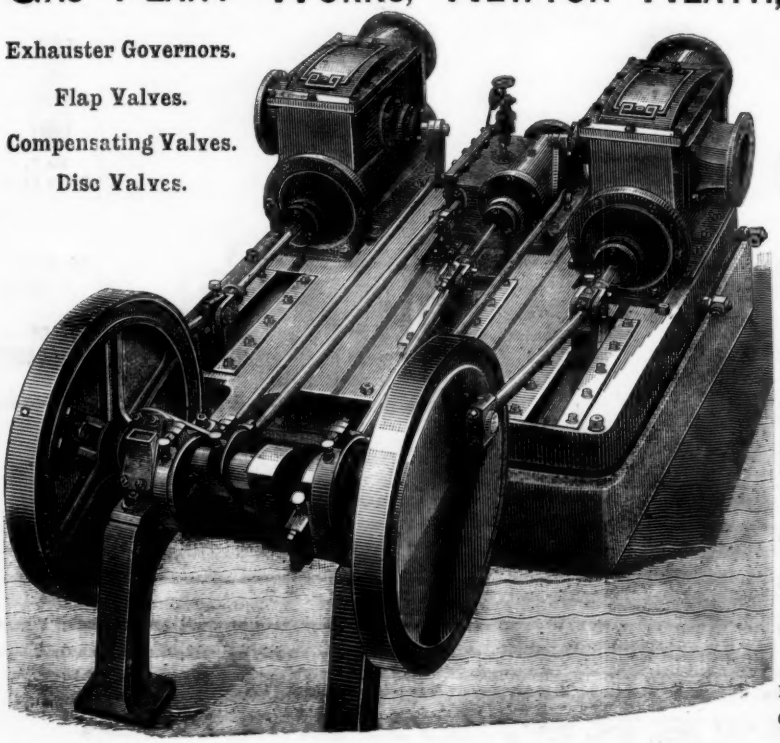
GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

Exhauster Governors.

Flap Valves.

Compensating Valves.

Disc Valves.



GAS EXHAUSTERS.

COMBINED
Steam-Engine and Double-Cylinder
RECIPROCATING
GAS EXHAUSTERS.

These Exhausters work without oscillation, keeping a perfectly steady gauge.

They will force against the highest pressures without slip.

They are substantial in design. The working parts are finished bright, and are provided with large wearing surfaces to ensure durability, and being external, they are easily got at for repairs.

They are very economical in the consumption of steam.

The workmanship and materials are of the highest class.

They are made in all sizes, from 2000 feet per hour upwards.

Three of these Exhausters recently made by us are passing 60 million cubic feet of Gas per day.

KIRKHAM, HULETT, & CHANDLERS' LTD.,

NEW PATENT "STANDARD" WASHER.

KIRKHAM, HULETT, & CHANDLER, Ld., have the pleasure to draw the attention of Gas Engineers and others interested in the question of the extraction of Ammonia and other Impurities from Coal Gas to their NEW PATENT "STANDARD" WASHER-SCRUBBER, which is being rapidly adopted by the Gas World, as shown by the following list, which comprises orders received for new "Standard" Washer-Scrubbers fitted with the improved "Wooden Bundles," and Machines supplied in past years renewed by substituting the same in place of the "Iron Bundles":—

NEW WASHER-SCRUBBERS.

The Gaslight and Coke Company—	Capacity in c. ft. per 24 hours.
Kensal Green Station	3,000,000
,, ,, ...	3,000,000
Liverpool	3,000,000
Glasgow	2,500,000
,, ...	2,500,000
Leicester	2,250,000
West Ham	3,000,000
Melbourne	1,500,000
Valparaiso (South America)	600,000
Barry and Cadoxton	500,000
Workington	500,000
Charlottenburg (Germany)	1,500,000
Magdeburg ,, ...	750,000
Erfurt	400,000
Rawmarsh	200,000
Derby	1,500,000
,, ...	1,000,000
Vercelli (Italy)	200,000
Lowestoft	500,000

RENEWALS.

The Gaslight and Coke Company—	Capacity in c. ft. per 24 hours.
Beckton Station	1,250,000
,, ,, ...	2,500,000
Nine Elms ,, (in part)	3,000,000
Shoreditch ,, ,, ...	2,500,000
Pimlico ,, ,, ...	2,000,000
The South Metropolitan Gas Company—	
Vauxhall Station (in part)	3,000,000
Birmingham	5,000,000
Kingston-on-Hull	400,000
Maidstone	1,000,000
Croydon	1,500,000
Melbourne	1,500,000
,, ...	1,500,000
West Ham	1,500,000
Edinburgh	1,500,000

Testimonial from the Chief Engineer of The Gaslight & Coke Co.

The Gaslight and Coke Company, Horseferry Road, Westminster, S.W.,

Messrs. Kirkham, Hulett, and Chandler, Limited, *Nov.* 25, 1889.

Gentlemen,—In reply to your enquiry respecting the result of putting "Wooden Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.—I am, yours truly,

(Signed) G. C. Trewby.

NOTE.—The first Washer referred to in the above was fitted with improved "Bundles" in May, 1888; and these have proved so satisfactory that The Gaslight and Coke Company have had several other "Standard" Washers fitted in the same manner, and have recently given an order for machines for 6,000,000 cubic feet per day.

396 "Standard" Washer-Scrubbers supplied (and in course of construction), equal to a daily capacity of 359,560,000 cubic feet of Gas.

PALACE CHAMBERS, BRIDGE STREET,

WESTMINSTER, S.W.

R. LAIDLAW & SON.

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

MAKERS IN EDINBURGH OF

STATION METERS, ALL SIZES
GOVERNORS,
PRESSURE REGISTERS
(To Indicate New Time),
PRESSURE GAUGES,
TEST GASHOLDERS
TEST METERS,
SIEMENS' WATER-METER,
ALL KINDS OF GAS APPARATUS & FITTINGS.

MAKERS IN GLASGOW OF

CAST-IRON PIPES, ALL SIZES
LAMP PILLARS,
STEAM-ENGINES,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
WROUGHT-IRON TUBES AND FITTINGS,
BEAMS, COLUMNS, TANKS, &c.

Wet and Dry Meters of every description repaired, altered, and adjusted, at prices which we shall be pleased to furnish on application.

A LARGE STOCK OF METERS ALWAYS READY FOR IMMEDIATE DELIVERY OR SHIPMENT.

Descriptive Price Lists, Estimates, & full particulars forwarded on application.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

IMPORTANT TO
GAS ENGINEERS AND GAS MANAGERS:

The most Economical, Reliable, and Handy Tool for Forge Work for

ENGINEERS, MACHINISTS, TOOL MAKERS, FITTERS, FORGERS, STAMPERS, COACH BUILDERS,

AND FOR USE IN

GAS-WORKS, SMITHIES, IRON-WORKS, COLLIERIES, &c., &c.,

IS

THE TANGYE GAS-HAMMER

(ROBSON & PINKNEY'S PATENTS)

As supplied to several of the principal Gas-Works.

TANGYES LIMITED
SOLE MAKERS.

As supplied to several of the principal Gas-Works.

Hand Gear.

Foot Gear.

(From Photos of the ¾ cwt. size.)

THE above illustrations represent THE TANGYE GAS-HAMMER as now made. Since its introduction it has been greatly improved both in design and simplicity of working. It has also been constructed to work either with Hand Gear or with Foot Gear.

This—the first Gas-driven Forging Hammer introduced—was designed, and at first recommended only for use in cases where steam was not available or could only be employed at great expense, but the data given below, and which are founded upon reliable and sustained test and trial, demonstrate that the **GAS-HAMMER** may be economically used in competition with the Steam-Hammer, even in places where the price of gas is at its highest.

"*Since the appearance of our* ['*The Engineer*'] *notice, the Hammer has been in some respects re-modelled, and its remarkable economy placed altogether beyond a doubt. . . . The Hammer described is that known as the ¾ cwt. size, and has a cylinder of 7 in. diameter and 6½ in. stroke. The maximum blow is very nearly that which would be given by* **a weight of 3 cwt. falling through a height of 1 ft.**; *and this can be repeated at the rate of* **110** *blows per minute. . . . Extended test in practical smith work has demonstrated that over* **2500 of the heavier blows** *referred to above, can be given with* **one pennyworth of gas** *at half-a-crown per* 1000 *feet—i.e., the Birmingham price to small consumers—or over* 4500 *varying blows for the same consumption.*"—"**The Engineer,**" **Sept. 10, 1886.**

The Gas-Hammer dispenses with Boilers, Coals, Ashes, and Dirt necessitated by Steam-Hammers.

It is ready for work at any moment, day or night, and works as economically for a few minutes' spell as when in sustained operation.

PRICE LISTS AND FULL PARTICULARS ON APPLICATION.

Tangyes Limited, CORNWALL WORKS, Birmingham.

London, Newcastle, Manchester, Glasgow, Paris, Sydney, Melbourne.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

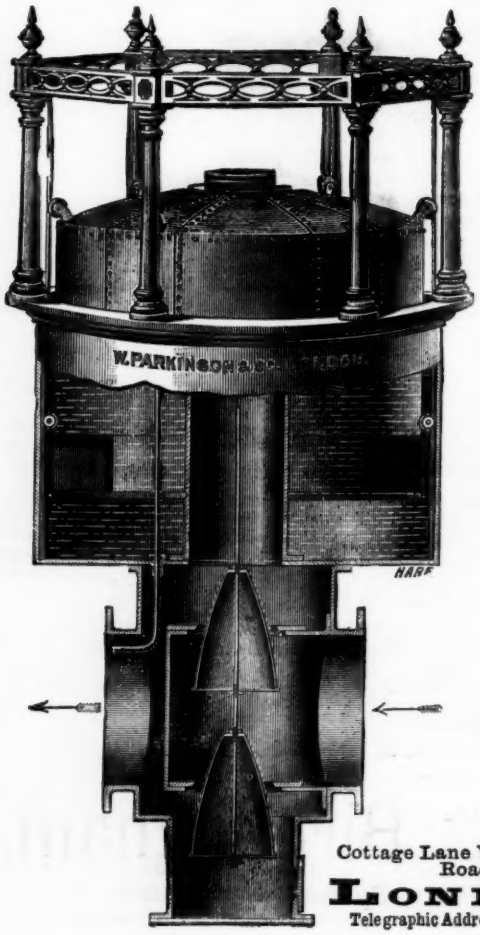
DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.



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No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 24, 1890.

The Gas Institute Meeting.

THE meeting of The Gas Institute for 1890 has been held; and the proceedings are now history, which may be commented upon, but cannot be altered by anything that may be said or thought of them. We are free to admit that, whether as judged from the numerical attendance, the number and quality of the papers read, or the enthusiasm that, up to a certain point, marked these proceedings, the Ryde meeting must claim to be regarded as at least as successful as most that have preceded it since the formation of the British Association of Gas Managers. It was not quite perfect, of course, as those who attended it would confess; but it is not our intention to drag any drawbacks, that could not fail to be recognized as they arose, into a posthumous notoriety which could not do any good, but would certainly give pain where none would willingly inflict it. Mr. Garnett could not have done more than he did to ensure the success of the meeting; and to his efforts the success that was in a high degree attained must be largely attributed. Ryde, moreover, is a very pleasant centre whence to see the Isle of Wight, with which most British tourists desire to make themselves acquainted at one time or another; and, in view of the special facilities provided for sight-seeing on this occasion, many of the members of the Institute took the opportunity of the meeting for combining the two objects of supporting Mr. Garnett and seeing the Island, and to this end brought their friends with them. The weather was fair, on the whole; and this most important factor in the enjoyment of a summer outing being assured, he would indeed be a churl, and no true British Gas Manager, who should fail to enjoy a trip to Ryde at this time of the year, let the business be what it might.

The circumstances attending this meeting were in many respects exceptional. So far as the Institute was concerned, the members who went to Ryde did so with the intention of celebrating in some way the survival of the organization through a period of doubt and difficulty which at any time during two years might have witnessed its death. There can be no question, however, that at Ryde there was every indication that from henceforth the Institute will again pursue an even existence. The jarring elements in its membership had been eliminated or suppressed; and there was more harmony among the majority who remain than has been the case of late years, when the members seemed to have hopelessly assorted themselves into warring bands, and the spirit of clannishness threatened to turn all the proceedings, whether technical or formal, into a conflict of groups and sections. It is only fair to say that, for the first time for many years, not a sign of this spirit was perceptible at Ryde. So far as the members who have remained in the Institute are concerned, union has grown out of disunion, and schism has only drawn the bonds of fellowship tighter round the faithful. We are not going to alter our opinions respecting the nature and merits of the unfortunate differences that have deprived the Institute of so many of its once most prominent members; but the truth must be told, which is that the majority do not hold themselves in any way responsible for the long series of muddles that have troubled the Institute, and entertain just enough indignation against those who, having (as they put it) brought the Institute into difficulty, then quitted it, to supply the necessary cement for binding together their own confraternity. They do not pretend that the Institute is perfect. It does not embrace all that it should; and it contains those who would be gladly spared. It is a human fabrication, and therefore faulty in many respects. But, after all, it unites the interest of a great many British gas managers; and, as such, it is yet hoped by some of its present members to be capable of much good in time to come.

If anything could furnish a guarantee for the honourable administration of the organization after this abnormal period of constitutional experiment, which terminated at Ryde, it would be supplied by the appearance of Mr. Joseph Hepworth, of Carlisle, in the position of President. There is not a more high-minded gentleman in the ranks of British Gas Engineers than Mr. Hepworth; and his name is quite sufficient evidence that any unworthy influences which may exist in the membership of the Institute will henceforward be rigidly restrained, if they may not be expelled. And he will be supported by a strong Council. It may, perhaps, be objected that the Council did not exhibit any remarkable amount of strength in dropping a fundamental part of their grand constitutional scheme in the face of opposition; but it must be said on their behalf that they could have done no other, unless they had departed from their declared attitude of subservience to the wishes of the majority of the members. From the moment when the proposals for

altering the qualifications of one class of members and the status of others came before the meeting, it was certain that the Council could only have carried their point at the risk—nay, with the certainty—of a rupture with the members. If they had persisted in forcing their scheme in the face of the objections evidently entertained to it, they might possibly have gained their desire, but only at the expense of raising a great deal of warm feeling, which it was specially necessary to avoid now that old animosities seem to be simmering down. Even a comparatively small minority against them would have spoilt the appearance of the proceedings, which were meant to be for the good of all; and the minority would certainly not have been small against any interference with the position and rights of existing ordinary members. As for the status of the extra-ordinary members, who were to have been relegated to a voteless and voiceless obscurity, although they had few friends out of their own order, the sense of the meeting approved the decision of the Council to treat them like the others. It would not only have been invidious, but dangerous in the legal sense, to have tampered with the vested interests of one class of members, while leaving those of another class intact. The result of the compromise that was arrived at on the matter is to create a curious inconsistency. Present members may apparently do anything they please without imperilling their rights in the Institute; whereas new members, elected after this date, will be liable to expulsion if they lose their qualification. It will take almost a generation to put this matter right. But again it must be said that the business could hardly have been settled differently, in the temper the meeting exhibited; and the Institute may even be congratulated that the irritating question of rules was disposed of at one sitting, without more confusion and feeling than was actually displayed. Everybody was grateful that the constitutional question, which has been a "burning" one, more or less, since the year 1882, was at last settled.

The quality of the papers submitted to the Institute this year, if those that had the fate to be read can be taken as a sample, was quite up to the average. Unfortunately out of the eleven papers in the list, three—and these not the least promising by their titles—had to be left unread; and one other was cut short in the discussion. There was regrettable waste of time in different ways during the meeting; and it was a source of much suppressed dissatisfaction that more business aptitude was not shown in dealing with the papers and discussions. The attendance at the sittings for the reading of papers was good, though the usual difficulty was experienced in collecting an audience with punctuality after any suspension of business. Altogether, however, the members exhibited a highly commendable and business spirit, which would have resulted in a bulkier volume of Transactions if it had not been checked by the President's amiable weakness for eulogistic oratory addressed chiefly to local ears, and the accompanying municipal ceremonial observances. With all the drawbacks that could be enumerated, however, the Ryde meeting was a very satisfactory one; and having regard to all things, it will be the general desire of those who took part in it that the shortcomings should be forgotten, and only the pleasant reminiscence of a week spent in good fellowship, with delightful weather, in a beautiful locality, kept as the distinguishing memory of the meeting of The Gas Institute of 1890.

The Papers at The Gas Institute Meeting.

In another column will be found two of the papers read at the Ryde Meeting of The Gas Institute. Mr. Newbigging's description of his wrestlings with a gasholder tank in a troublesome situation is written in a vein which is altogether new with the author. He is quite humorous in his talk about the difficulties of this undertaking; and becomes even boisterously jolly when referring to the admirable qualities of his Clerk of the Works, who had such an enviable gift for making light of difficulties. There is not a great deal of matter in the paper, when stripped of the embroidery supplied by the writer's fancy; but it went down very well. The author being absent, the paper was read by the Secretary (Mr. W. H. Harvey, B.A.), and there was consequently no real discussion on it. The chief point in the communication was the plan of putting in the tank in sections, from which Mr. Wyatt has anticipated some economy. Although Mr. Newbigging did not say anything particular upon this head, it may be supposed that in his special case the adoption of the sectional plan of building presented no inconsiderable advantage in this respect. One remark of Mr. Newbigging's calls for some comment here, as it passed unnoticed at the time. It was the statement that the contractors for gasholder tanks generally lose money by them. It seems to us that this generalization requires some qualification or explanation. It is probably true enough for the small tanks constructed at rare intervals in country towns, where the opportunity for tendering for the work is thrown open to the local builders, and is frequently an occasion of the ruin of men of this class with more ambition than experience. It is difficult to prevent these men from burning their fingers; but as a bankrupt contractor is a nuisance to the engineer under whom he works, a word or two of counsel for the avoidance of this trouble may not be out of place. Mr. Newbigging's observation utterly fails to touch the examples of the large contractors—like the Lucases, Airds, Docwras, and their fellows—who commonly work for the large Companies. These firms seldom incur losses, because they will not touch a job that is not worth their while; and they have the plant and staff necessary for doing work of this class well and expeditiously. In the cases of small jobs, which Mr. Newbigging had more particularly in mind, it behoves the engineer to make his estimates of cost very carefully, and be particular with regard to the contractor selected. It should not be his object to get the work done for a figure very much below what he knows it ought to cost, but to pay a fair price for it, and let the contractor live as well as his own employers. This is the only way to depend on getting really good work, although, of course, the contractor sometimes carries out his obligations faithfully to his own loss. Work completed under these conditions, however, more especially if the contractor did not know from the commencement the risks which he had to run, is a heart-breaking affair. If the contractor gets a fair price for his work, and yet loses in the end through causes beyond control, it is a different matter. He has to run the risk of accidents, and must put up with the bad as well as the good consequences of the contract system. The only care that can be shown by the Engineer is to allow a fair price for the work required to be done, and not to expect impossibilities. There is unfortunately a class of engineers in the gas industry, as in other departments of engineering, who seem to think that contractors ought not to make any profit, but must be ground down to starvation prices to begin with, and then be harassed and penalized into the Bankruptcy Court. Mr. Newbigging is not one of this class—being, indeed, one of the most kindly and considerate men in the profession; so we are not afraid of his taking to himself anything we may say upon this head. At the same time, he knows what some others are, and will bear us out in holding that in the end the fairest and most considerate course of treating contractors is the cheapest. There must be no laxity, of course, in insisting upon the carrying out of proper conditions; but it stands to reason that a contractor will do his work better when he knows that in this way he will make a reasonable profit, than when he sees loss, and perhaps ruin, staring him in the face however he may act.

Mr. Harrison Veevers's paper seemed to be somewhat over-padded with historical references, which took time, and, though interesting in themselves, and very creditable to the author's research, did not offer discussable subjects. Consequently, the auditory agreed with one consent in treating the paper as only a vehicle for the introduction to their notice of Mr. Wilton's sulphate-extracting arrangement, which is doubtless an excellent invention, but capable of being described very briefly, and without the preliminaries that Mr. Veevers considered necessary. Whatever may be thought of the merits of the paper, regarded as a contribution to the Transactions of the Institute, Mr. Wilton will not be able to complain of the reception accorded to his useful improvement in the practice of sulphate works.

The Question of Labour in Gas-Works.

In another column will be found the text of the agreement now settled between The Gaslight and Coke Company and their men employed at Beckton. It differs in several respects from that originally proposed by the Board, as will be seen upon comparison of the clauses with those of

the first draft. The main thing about it is that it binds the men signing it to a 28 days' engagement, which can be determined at any time by giving a written notice of equal length. Theoretically, as all these notices may be given simultaneously, the power of the men to strike, which is upheld by the Union as their most precious privilege, remains intact under this arrangement; but practically all constraining force is withdrawn from such a proceeding by the length of time needed for it to come into operation. The forfeiture clause is altered in a way decidedly more favourable to the men, as they will only sacrifice their back pay if they absent themselves or leave without giving the 28 days' notice. For improper conduct, insubordination, &c., the Company may dismiss any man without notice; but his money up to the day of dismissal is to be paid to him. It is unnecessary to comment upon the other clauses. The agreement should be fairly satisfactory so far as it goes; and the best guarantee that it will work well is the fact that the Union have not been strong enough to keep the men outside all engagements of this kind, as the leaders would have been only too glad to do if they had had the power. All Thorne's talk about men not giving any notice when they next think fit to strike, is now reduced to mere vapouring by the endorsement which he and his associates have been forced to accord to the principle of a monthly engagement and notice. He can scarcely have the temerity to declare that he does not regard these new Beckton agreements as binding on the men who sign them; it would puzzle even the Rev. W. A. Morris to find ground for condonation of such a doctrine if promulgated. Hence it may be concluded that Thorne and his party have at last seen the folly, if not the iniquity, of counsels of repudiation of engagements freely entered into, and will henceforward respect the monthly agreements of the Chartered stokers more than they once did the weekly engagements which have now been almost universally discarded. There could not be a stronger proof that circumstances have changed since last winter for the party of conflict. Now that the Beckton difficulty is ended, the only place where there is any pressing trouble between gas workmen and their employers is Leeds. Here there is a dispute over a proposed agreement, which the men think would place them at a disadvantage as compared with their actual condition. At Bromley (Kent), and in one or two other small works, there have been weedings out, originating disputes; but the cause of law and order is being satisfactorily maintained.

Society of Engineers.—Last Tuesday the members of this Society, to the number of about a hundred, paid a visit to the extensive premises of the Thames Iron-Works and Shipbuilding Company, Limited, at Blackwall. Among those present were: Mr. H. Adams, M. Inst. C.E. (President), Mr. J. W. Wilson, jun. (Vice-President), Mr. J. Bernays, Mr. Jabez Church, Professor Robinson (Past-Presidents), Sir R. Rawlinson (an honorary member), and Mr. G. A. Pryce Cuxson (Secretary).

The Gas Supply of Stockholm.—According to *Industries*, the gas supply of Stockholm, which is now in the hands of the Corporation, is becoming each year a source of increased profit. The transfer of the works to the municipal authority took place in 1884, since which time the business has steadily improved, as will be seen from the following figures, giving the profits: In 1885, 977,910 kr.; in 1886, 962,318 kr.; in 1887, 1,076,185 kr.; in 1888, 1,165,987 kr.; and in 1889, 1,325,638 kr. The production of gas last year was about 11 million cubic metres, or 388 million cubic feet; being about 4¼ per cent. more than in 1888. The consumption of gas for public lighting has increased 3 per cent.; the private consumption for lighting, about 2½ per cent.; and the consumption for cooking, heating, and motive power, 45·3 per cent. The last figures are very significant.

The Salford Corporation and Mr. Ellis Lever.—Last Friday and Saturday, Justices Denman, Charles, and Vaughan Williams, sitting as a Queen's Bench Divisional Court, had before them a motion for a new trial of the action brought by the Salford Corporation against Mr. Ellis Lever, in which the defendant was condemned in damages to the amount of £2339. The matter was dealt with by Mr. Justice Day and a special jury at Leeds in March last (see *ante*, p. 598); and the facts will be fresh in the recollection of our readers. Mr. F. Lockwood, Q.C., M.P., and Mr. Lawson Walton, Q.C., appeared in support of the motion, which was based mainly on misdirection, and also on the ground that, the defendant being unavoidably absent, through ill-health, when the cause was heard, he was unable to prove his case. Mr. Waddy, Q.C., M.P., Mr. Henn Collins, Q.C., and Mr. Gould represented the Corporation. Their Lordships reserved judgment. A report of the arguments will be given next week.

WATER AND SANITARY AFFAIRS.

The meeting of delegates from the London Vestries and District Boards held in the Vestry Hall of St. James's, Westminster, last Thursday, was evidently, as might be expected, brought together by its promoters for the special purpose of aiding the movement which is to place the London Water Supply in the hands of the County Council. The removal of the water supply out of the hands of the Companies was the dominant idea in the two reports laid before the meeting, and in the resolutions emanating from the Vestry. The alleged "loss to the rate-"payers by the quinquennial valuation now in progress, "permitting an increase of charge to the consumers "without an equivalent expenditure of capital," was merely brought forward, in what may be called the *agenda*, as auxiliary to a request that the Government should "forthwith introduce a Bill to enable the London County "Council to acquire the undertakings of the eight Water "Companies now supplying London." But the delegates, when they entered into conference, were not inclined to rely on the far-off prospect of the water supply being transferred to a public authority. Neither were they all in love with the County Council. Mr. Beal succeeded in getting his first resolution carried, which affirmed "the "necessity of the water supply of London being placed "in the hands of a municipal body representative of "London." But immediately afterwards a delegate from another Vestry than that of St. James, interposed a resolution which declared that "as a preparatory step" towards the transfer of the water supply, it was "imperatively "necessary" to do something towards preventing any further increase in the charges for it. Judging from the general tone of the meeting, it may be inferred that the delegates cared comparatively little who held possession of the supply, if only the water-rates were kept from rising. But Mr. Beal and his coadjutors had a different policy, and made use of the valuation grievance simply as a lever to push on the main question, which consisted in getting the water supply out of the hands of the Companies. Nevertheless the "preparatory step" was decided upon, although Sir William Farrer, in a speech which contained some good points, warned the Vestries that, in asking the Government to bring in a Bill to abrogate the statutory powers of the Companies, they were exposing themselves to the risk of "an additional slap in the face." Mr. Beal subsequently came forward with his own proposal, to which we have already referred as the prime object of the meeting. That proposal was for a Government Bill to enable the London County Council to get possession of the supply, with power to introduce an independent (that is to say a competing) supply, if all other modes of proceeding failed. Agreement, compulsion, or else competition—such were the conditions announced. With some alterations, chiefly verbal, but partly setting aside the London County Council, Mr. Beal's resolution was ultimately carried. The President of the Local Government Board is now to be asked to receive a deputation from the local authorities in support of the resolutions; and Mr. Beal is to be the spokesman.

Reviewing the prospect thus presented, we apprehend that Mr. Beal will have little to say to Mr. Ritchie concerning the assessment, except as it furnishes an argument for a speedy transfer of the undertakings. Perhaps Mr. Beal is convinced that the power of the Companies to charge according to the rateable value cannot be interfered with. Mr. Ritchie has given him fair ground to go upon in another direction, by saying that the power of the Water Companies to charge according to the rateable value has been conferred upon them by statute; and therefore "cannot be dealt with alone." "The matter is "one," continued Mr. Ritchie, "which should be considered "in connection with the whole question of water supply." It is on these lines that Mr. Beal is moving. But he must know full well that "the whole question" cannot be dealt with in the present session of Parliament. Mr. Ritchie has distinctly asserted that he could "hold out no "hope of dealing with so difficult a question during the "present session." Yet, if the resolutions of the delegates are to be supported, the Government is to be requested "forthwith to introduce a Bill to enable the London County "Council, or some other properly (*sic*) representative "body," to obtain possession of the water supply. After what Mr. Ritchie has said in Parliament, he might reason-

ably decline to receive a deputation coming with such a proposal at the present time; seeing that it could not answer any practical purpose. Even the suggestion that Mr. Causton's Bill, touching the assessment, should be supported by the Government, is shut out by the statement of Mr. Ritchie that this forms part of "the whole "question of water supply."

For the terms on which the transfer of the water supply is to be effected, if it takes place, we look into the report of the St. James's Vestry, and there find it stated that £36,666,666 of 3 per cent. stock would have to be created, in order to pay the same income as Water Companies' stock at the present time. Anything less would, of course, leave the investors with a diminished return for their money. Granting that something might be deducted in consideration of increased security, the deduction could not materially affect the total. Yet if we are to judge by the remarks of Mr. Beal, and the calculations given in the Vestry report, all that is contemplated is to give 3 per cent. stock to the extent of £28,600,000; being twenty-six years' purchase of "last year's profits" (or really the profits in 1888), taken at £1,100,000. The year's interest on the foregoing amount of stock would be £242,000 less than this. Another estimate of purchase is based on the average market value of stock for the last three years, and is shown to require £31,296,846 stock at 3 per cent. Yet something like £28,000,000 of 3 per cent. stock is the amount which Mr. Beal and his friends seem to think sufficient for the Water Companies to receive. As for an independent and competing supply, we find in the report emanating from the Vestry of St. James some cogent argument against such an undertaking. Thus we read: "It would probably "prove more economical, as well as more equitable, "for the Council to acquire the properties and interests "of the existing Companies, even at an extra initial "cost of three or four million pounds, than to embark "on an enterprise which must largely be of a speculative, "and probably unremunerative, character." The basis of this statement is an estimate of £26,000,000, capable, therefore, of being enlarged to £29,000,000 or £30,000,000. The highest of these sums unfortunately falls below the level of the *quid pro quo*. As for getting a meter supply from the Companies, it is a little curious to find the Vestry report giving some really good reasons against such a method of supply. On the whole, purchase is very distinctly aimed at, and nothing else; but on such terms that we may justify ourselves in applying to the transaction a phrase employed at the meeting of delegates, and designate the loss of millions—should it come to pass—as "legalized robbery."

Death of Mr. J. M. Gaines.—The death is announced, at the age of 69, of Mr. John Michael Gaines, who for the long period of 45 years was in the service of the Commercial Gas Company.

Mr. W. Daley, Engineer and Manager of the Dunedin City of Suburban Gas Company, is about to open an exhibition of gas-burners in the city. He proposes to have samples of all ordinary modern burners—union jets, batswings, and regulators—for oil, wood, water, and coal gas, but no Argands. Side by side with these will be samples of old, early, and out-of-date burners, for comparison, when lighted. The exhibition should prove interesting and instructive to the citizens.

The Management of the Gravesend Gas-Works.—The post of Engineer and Superintendent of the Gravesend and Milton Gas-Works, for which applications were invited in our advertisement columns a few weeks ago, has been conferred on Mr. Joseph Davis, of Bath. In reference to this appointment, a correspondent (one of the candidates) writes to say that he and the other unsuccessful competitors were informed by post-card of the result of the Directors' decision. He remarks on this proceeding that "parsimony could hardly farther go; being removed from its utmost extreme by the use of a stout and not a thin card."

The Lacoste Water-Meter.—Last Thursday, a number of members of the London County Council and the London Vestries attended at the Polytechnic Institution, Regent Street, to witness the working of the water-meter designed by M. Lacoste, of Paris, and described in our "Register of Patents" on the 27th ult. (p. 931). The meter has been constructed principally for use in domestic supplies; and the chief merit claimed for it is that it exactly measures the quantity of water passed through, however small it may be. In view of the evidence recently given at the inquiry now in progress under the auspices of the City Corporation, considerable interest was taken in the exhibition of the capabilities of the new meter, the action of which was regarded as satisfactory.

THE GAS INSTITUTE.

PROCEEDINGS AT THE TWENTY-SEVENTH ANNUAL MEETING,

HELD IN THE

TOWN HALL, RYDE (I.W)., JUNE 17 TO 19, 1890.

GEORGE GARNETT, Esq., M. Inst. C.E., President.

REVIEW OF PROCEEDINGS.

THE Ryde Meeting of The Gas Institute opened most promisingly on Tuesday last in the very handsome Town Hall, which was decorated for the occasion. The weather was all that could be desired; and long before the hour appointed for the commencement of business, it was evident that the attendance would be quite up to the average of a provincial meeting. During the whole of the previous day, the members and visitors had been gathering from all parts—many accompanied by ladies; for Ryde, as we recently remarked, is one of the play-places of the country, and the opportunity for combining business with pleasure was too favourable to be wasted. Monday evening was fairly lively on the Ryde Esplanade, with the usual mutual greetings of old friends parted throughout the year, whose meetings are among the chief attraction of these gatherings. The absence of some well-known faces was, however, noticeable; and inevitably so, for it is always the vacant chair that attracts the eye on festive occasions. As if by common consent, however, hardly any reference was made conversationally to the secession; all present seeming agreed to drop the subject and enjoy themselves together as best they might, which was not indifferently.

Tuesday's proceedings began with the entry into the Town Hall (called the Large Hall, to distinguish it from the smaller apartment that was subsequently occupied for the reading and discussion of papers) of the Mayor and Corporation of the Borough in procession of state. In welcoming the members of the Institute to the town, the Mayor (Mr. Alderman Barton) testified to the regard in which Mr. Garnett is held by his most eminent fellow-townsmen. Mr. Alderman Barrow followed the Mayor; and he was succeeded in his turn by Mr. J. Hepworth, (the President Elect), to whom was entrusted the duty of acknowledging the civic compliment on behalf of the Institute, which he did in an eminently pleasant manner. The vote of thanks to the Mayor was seconded by Mr. R. Mitchell, of Edinburgh, and was of course carried by acclamation. The departure of the municipal dignitaries in the same way that they came, preceded by the symbolic mace, which, in the absence of aught else, would perpetuate Mr. Garnett's memory in Ryde, terminated a very pleasing and picturesque incident.

Mr. Garnett then took the chair, facing a good assemblage of members of the Institute and friends, among whom there was a fair sprinkling of ladies, whose presence he took the opportunity of acknowledging. The new Secretary (Mr. W. H. Harvey, B.A.) was at this period introduced to the members by the President, and made a good impression. Accordingly, it was in an atmosphere of good feeling that Mr. Garnett commenced to read his second Inaugural Address, which will be found elsewhere. Owing to the indifferent light on the dais, the President was obliged to sit for his reading. It is hardly fair to criticize this address, as though it were Mr. Garnett's only production of the kind. It would be hard on a younger man to have to write one presidential address after another in which he had given the cream of his technical experience. Mr. Garnett endured the ordeal with considerable success; but it would be affectation to deny that the whole of this second address is chatty rather than profound. It begins somewhat tamely, but warms up as it progresses. It contains several acute observations on men and things, instinct with luminous common sense, such as a practical gas manager of Mr. Garnett's position and experience might be expected to make. His remarks on the action of the London Gas Referees, and on the coal question, may be cited as very much to the point. On the other hand, it is difficult to trace the kindly Mr. Garnett in some of the sentences of his address, in which remarks are made with reference to third parties which will not look well in after years when recorded in

the printed Transactions of the Institute. It is only fair, however, to the members generally to state that these portions of the address were received in chilling silence. The conclusion of the address went down very well.

Mr. Newbigging was heartily received when he was named by the President as the recipient of the Birmingham Medal. Mr. Newbigging's several qualifications for this distinction were genially set forth by the President, who is never so happy as when bestowing awards to becomingly grateful recipients. On such occasions his flow of eulogistic oratory is profuse, and sometimes seems to overwhelm its objects, who probably recall, while being thus talked at, the half-forgotten sensations with which they received prizes at school. After Mr. Newbigging's appearance and modest speech in reply to the President's laudations, Mr. W. A. Valon was called up to receive his fourth President's Medal (and the first premium) for his useful paper of last year. The other two premiums were awarded to Messrs. George Anderson, and N. H. Humphrys respectively; the year's record in this regard being thus one of "all prizes and no blanks." After this came the usual interval for luncheon, by which time the general impression undeniably was that the meeting had begun most promisingly.

With the afternoon came the tug of war. The presence of Mr. Radcliffe (the Solicitor to the Institute) on the right hand of the President, showed that care would be taken to transact the business "decently and in order." There can be little doubt that if the Institute management had been properly advised a few years ago, as it has been of late, much dissension, blundering, heart-burnings, and expense would have been avoided. The first sign of Mr. Radcliffe's intervention was shown immediately after luncheon, in the reception of the report of the Scrutineers on the voting for the next year's officers, which resulted, as already noted, in the election of Mr. J. Hepworth to the presidency. This part of the business being disposed of, the meeting was declared extraordinary, with the object of dealing with the proposal to register the Institute under the Joint-Stock Companies' Acts.

The work that followed the declaration of the President was in the main divided between the Solicitor and Mr. Duxbury, who in this matter acted as mouthpiece for his colleagues of the Council, and thus spared Mr. Garnett a good deal of general but necessary work which would have severely taxed his powers. As it was, the President was able to apply his amiable despotism in ruling the storm which speedily arose when the matter of the rules was fairly broached. Mr. Radcliffe's task was to read through the Memorandum and Articles of Association proposed by the Council for registration by the Board of Trade. Then Mr. Duxbury moved the general resolution required to prepare the way for the consideration of the clauses; and in so doing he gave a remarkably clear and concise statement of the advantages of incorporation, as a question of principle. This argument was necessary for the instruction of the members, few of whom, as we recently remarked, knew at the close of last year's meeting that the process for the reconstruction of the Institute would take this particular direction. Immediately after Mr. Duxbury's exposition was seconded, Mr. C. E. Jones intervened—sounding a note of opposition, which quickly went beyond the bounds of the question; and the speaker, with a confusion of mind which, to do him justice, is rare in his case, travelled into a discussion of the merits of the scheme of the Council, for which he was promptly called to order. At this stage, Mr. George Bray first signified his knowledge of, and interest in the proceedings, by formally entering a protest against the whole programme. An irregular discussion followed; several members betraying an almost incurable difficulty in keeping within the limits of the question. Eventually the motion was carried, with Mr. Bray the only dissentient. Mr. Duxbury's next task was to move the Articles *seriatim*—a long and tedious business, which was transacted with commendable despatch, considing the nature of all discussions of this order. The Memorandum of Association gave no trouble, and was quickly disposed of; but the Articles had hardly been entered upon when the existence in the hall of a considerable spirit of opposition to some points of the Council's programme, began to be manifest. A question arose on the sixth article (which defines the qualification of members), which, in different forms, ran through the whole afternoon. One point after another cropped up; the general body of members being apparently strongly disinclined to any noticeable alteration of the constitution of the Institute in this respect. If the net result of the day's discussion of their scheme seems to convict the Council of a little softness in the matter of principle, this spirit in their constituents must be taken into consideration. At one time it threatened that the whole business would be muddled through the propensity of many speakers for mixing up general principles with personal applications. Patience carried the day, however; and ultimately something like order was evolved out of the chaos, although all Mr. Radcliffe's acuity was needed to prevent the passing of some unworkable and mutually contradictory resolutions. It was adopted as a guiding principle in this matter of membership that any new restrictions as to qualifications should be applied to future applicants only. This fundamental alteration afterwards made it easier for the Council to deal with the opposition of Mr. Bray and others to the proposal for the relegation of the extraordinary members to a voteless and voiceless class. Having agreed to make the new regulations affecting ordinary members prospective, the Council could not refuse to grant the same concession to the other class of members; and this pacified Mr. Bray. There was a little conversation upon the subject of subscriptions; but with the settlement of Article 52 the real interest of the members evaporated, and the rest of the Articles were rapidly rushed through. Thus ended another noteworthy day in the history of the Institute, if not precisely to the full satisfaction of everybody, yet more successfully than might easily have been its termination.

Much joviality marked the Smoking Concert given in the evening by the Mayor of Ryde in the large Town Hall; and here it may be fittingly acknowledged that great credit should be given to Mr. Garnett for the unstinted use that he made of his local influence and connections so as to serve the interests, both serious and social, of the members of the Institute. It may be freely conceded that the Institute will go a very long way before a more pleasant "pitch" than Ryde will be found. Mr. Garnett may take the comfortable assurance to his heart that the members fully appreciated his efforts to make their stay in Ryde comfortable in every respect. If anything, he spoilt them for any other place, where the President, if a local man, may not have such a long record in the town as Mr. Garnett has enjoyed in Ryde.

The serious work of reading papers was begun on Wednesday. Mr. Newbigging's communication, which was written in a style that exhibits the author in a new light, was read by the Secretary in the absence of the writer. It does not require detailed criticism. The other papers read will be commented upon in another place as they appear in the JOURNAL. Here it should be acknowledged that, on the whole, the attendance of members at the reading of papers was distinctly larger than has been observable in recent years; the strictures that have been passed upon their conduct in this regard having evidently had a beneficial effect. The day concluded with a *soirée* given by the Mayor and inhabitants of Ryde, after the Council had been entertained at luncheon by Mr. Alderman Barrow, whose beautiful grounds were thrown open to members and their friends during the week.

Thursday was devoted to the reading and discussion of communications, although the opening of the Rose Show of the local Horticultural Society was a great temptation to desert the afternoon sitting for the fresh air and flowers. Very few words will suffice for commenting upon the business, other than the reading of papers, with which the meeting terminated on Thursday. An address, handsomely illuminated and bound, and couched in highly flattering terms, was presented to Mr. Garnett by the Council, who had anticipated the wishes of the members in this regard. It was intended to acknowledge the services of the President during the exceptional period through which he had held office; and the task of presenting it was gracefully performed by Mr. Valon, upon whom this duty fell in the absence of the President-Elect, Mr. Hepworth. Together with this testimonial was given a framed photograph of the six members of the Council who kept together when all their colleagues retired from office. We will not be so ungracious as to raise once more the question of the real value of these gentlemen's services to their colleagues. It is enough to admit that they have played a very popular part, and are becoming venerated as heroes and demi-gods. Mr. William Longworth, the

Honorary Secretary, received another present—this time in the shape of a gold watch and chain, worth 50 guineas; but we think that Mr. Duxbury, who has done a good deal of arduous and thankless work for the Institute, which does not properly come within the duty of an ordinary member of Council, might have been more fairly treated while the testimonials and presents were being distributed. So much deliberate misrepresentation has been circulated as to the language which the JOURNAL has used with regard to these gentlemen's policy, and towards the members who left the Council and the Institute and those who remained, respectively, that there is a great temptation now, when these matters are being referred to for, it is to be hoped, the last time, to attempt a correction. We refrain from anything of the kind, however, knowing that those who live by fomenting strife and circulating misrepresentations will go on doing so whatever we may say, and that others, whose good will is worth having, would willingly join us in subscribing to the old sentiment—"May Difference of "Opinion never alter Friendship." Carlisle was selected as the place of meeting for next year, to the general satisfaction of the members. Having been called far South this year, it is but fair that the North should have the next turn. Mr. Hepworth is popular with both North and South; and there is small reason to fear he will be less esteemed at the end of his year of office than he is at its beginning, although in all probability there will be more work and less play at Carlisle than there was last week at Ryde. The business of the day closed with the customary votes of thanks. The evening open-air concert in the Corinthian Club grounds was a pleasant gathering, where, by many groups, the technical subjects mooted at the meetings of the previous two days were informally discussed.

The meeting concluded with the advertised steamboat trip round the Island, which was favoured with brilliant weather. Starting from Ryde in the fine paddle-wheel boat, *Her Majesty*, an excellent run was made to Ventnor, where a stay of an hour and a half was permitted. The wind was rather fresh from the westward, which made the boat a little lively in passing from the Needles to St. Catherine's Point; but afterwards the sea was as smooth as a pond. Luncheon was served on board. On arriving at Ryde, at 6 p.m., a few parting words were spoken before landing by the President, Mr. Hepworth, and Mr. C. E. Jones on behalf of the Institute, and by the Mayor as representing the town; and so the meeting of 1890 terminated with cheering and hand-shakings like those that used to mark the finish in the old days.

REPORT OF PROCEEDINGS.

The Twenty-seventh Annual Meeting of the members of The Gas Institute was held on Tuesday, Wednesday, and Thursday of last week, at the Town Hall, Ryde, under the presidency of Mr. GEORGE GARNETT, M. Inst. C.E. There was a large attendance of members and visitors, including many ladies. The proceedings were inaugurated in a very formal and impressive manner by the procession, up the centre of the Hall, of the Mayor (Mr. Alderman Barton) and Corporation of the Borough, preceded by the gold mace presented a short time since to the Corporation by Mr. Garnett, which was laid with all due ceremony in front of the Mayor, when he took the chair.

WELCOME TO THE INSTITUTE.

The PRESIDENT first introduced The Gas Institute to the Mayor and Corporation; remarking that they might be considered as a battery of brain power. It had been said that "those who think must govern those who toil;" but there were many present who combined both functions, carrying good heads on their shoulders, and yet having the horny hand of toil. They were all engaged in enlightening the physical darkness of the country, and represented every part of the United Kingdom—England, Ireland, Scotland, and Wales—and he had an apology from the President of the Gas Institute of the United States, saying he could not be present that day, but would be on the morrow.

The MAYOR said he was very pleased that the honour had fallen upon him of giving a welcome to so large, influential, and representative a meeting—a meeting such as was very rarely brought together in that Hall; and he discharged the pleasing duty with very great satisfaction, not only on his own behalf, but on that of the Corporation, the burgesses, and inhabitants of the neighbourhood. He hoped the result of the discussions on which they were about to enter would be an improvement in the manufacture of gas. Their own gas-works were considered a model; and probably on this account Mr. Garnett had been selected as President. But he could assure the members that Mr. Garnett was a most popular man in his own neighbourhood; and he could sincerely congratulate the Institute on the choice they had made. He concluded by giving the Institute a hearty welcome to Ryde.

Alderman BARROW supported the remarks made by the Mayor in welcoming the Institute; and, in reference to the Ryde Gas-Works, said he had inspected many works both at home and abroad, and did not remember to have ever seen any which answered their purpose better. He had no doubt the meeting would tend to give an impetus to scientific investigation, in which not only that locality but the whole country would benefit.

Mr. J. HEPWORTH (Carlisle) then proposed a vote of thanks to the Mayor and Corporation for the hearty welcome which had been extended to the Institute.

Mr. R. MITCHELL (Edinburgh) seconded the motion, which was carried by acclamation.

The MAYOR, having briefly responded, left the chair, into which he inducted Mr. Garnett, and left the hall with the members of the Corporation, in the order in which they had entered. The business was then proceeded with.

The minutes of the last meeting were taken as read.

APPOINTMENT OF SCRUTINEERS.

Mr. J. H. Lyon (Cosham) and Mr. J. H. Hopper (Glastonbury) were appointed Scrutineers.

THE SECRETARY.

The PRESIDENT next referred to the offices taken by the Institute at No. 3, Victoria Street, Westminster, which, he said, would form a place of meeting for members or visitors from abroad. He then introduced the new Secretary (Mr. W. H. Harvey, B.A.) in very flattering terms.

Mr. HARVEY remarked that he had no idea when he came to the meeting that he should have such kind words said of him as those which the President had used. He only hoped that in the future he should be able to look back and feel that there was some truth in them.

THE PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—You have already been welcomed to Ryde by the Mayor and Corporation, whose motto is "*Amicitas Salubritas, Urbanitas;*" and, looking at the pleasantness of the situation, the healthfulness of the town, and the courtesy which will be extended to you, I hope you will verify the appropriateness of the motto, and return to your homes with many pleasing recollections of your visit to the Garden Isle. In the next place, my duty and inclination alike concur in expressing my unfeigned thanks for the honour conferred upon me by my election for a second time to the presidential chair, and the compliment bestowed in selecting Ryde as your place of meeting.

Of all the improvements that the active march of scientific research and enterprise has brought forth during the last quarter of a century or so, the continually increasing demand for artificial lighting is by no means the least prominent. The jet of gas from a small iron burner, that was belauded eighty years ago as the source of refulgent rays that rivalled the noonday sunshine itself in brilliance and splendour, would now be regarded as fit for nothing better than the lighting of a back-door passage. The public have gradually advanced from the pine torch to the rush light and tallow dip, then to the gas-jet, and from that to many varieties of modern gas, oil, and electric lamps, including many kinds of incandescent or regenerator gas-burners, petroleum lamps of high power, the arc and the incandescent electric lamps, and special powerful lights of the "Lucient" kind. The whole facts of the case, however, are not covered by the simple assertion that there is an increasing demand for artificial light. The progress of science and enterprise has also brought with it increased competition. Trade expenses are watched and scrutinized with a care and acuteness that

is also continually increasing, with a view to bringing them down to the lowest possible point. The gas bill, which was formerly passed for payment as an unavoidable charge, like the poor-rate or the income-tax, is now carefully checked and examined, to see whether similar lighting effect could not be obtained by other methods at less cost. And the question is not viewed from the financial standpoint only, as many people are glad to go in for high-class lighting of a brilliant character, almost regardless of cost. The question that would, twenty years ago, have been merely one of gas pipes and burners, is now extended to include the claims of oil and electricity, with the result that gas no longer enjoys the practical monopoly of our streets and shops—its rivals make their appearance in every important thoroughfare.

The advent of these rival schemes has created great activity among manufacturers of gas appliances, who are vieing with each other in bringing forth arrangements that shall provide the maximum of lighting effect from a minimum quantity of gas. It is safe to say that ten times as many new gas-burners have been introduced during the last ten years as were forthcoming during the previous seventy years of existence of the gas industry. The claims of the various systems of artificial lighting have roused the consumer to the appreciation of a point which, although it directly concerns his pocket, had hitherto escaped his attention, and that is the amount of effective lighting service, or "duty," as we may call it, that he receives in return for his purchase of gas, oil, or electricity, as the case may be. That the increased activity in the matter of gas-burners has greatly redounded to his advantage can be readily demonstrated, though the fact would be much more apparent and tangible if he continued to be satisfied with a fixed lighting effect, instead of desiring one that is ever increasing.

For many years it was supposed that the Sugg standard Argand burner represented the maximum lighting effect that it was possible for any consumer to obtain per cubic foot of gas consumed; and this ranges, with gas of ordinary quality, from 3 to 3½ candles. But many of the modern burners now in actual use by consumers yield an effective lighting effect of 8 or 10, and as much as 20 candles per cubic foot of gas has been claimed; so that the value to the consumer has been increased threefold, although the gas supplied has practically remained of the same quality. On the other hand, the prospect of competition has roused the suppliers of gas to a sense of the necessity, not only of maintaining the quality and purity according to the obligations imposed upon them by Act of Parliament, but also of selling it at the lowest possible price.

A marked tendency in a "rest and be thankful" direction was formerly observable, so soon as a gas undertaking was in a position to hand over to the shareholders the maximum amount of profit that they were legally entitled to receive. The manner in which complaints from customers, or, indeed, applications from intending customers, were received was not particularly remarkable for suavity or a disposition to oblige. But all this has now given way to a new and a better state of things. Not only are the suppliers of gas using every endeavour to offer the customer the inducement of low rates, but they are also seeking to facilitate the increase of business by concessions in the way of laying service-pipes free of charge; letting stoves or other apparatus for hire at moderate rates; and teaching, by means of exhibitions and lectures, the best and most economical methods of using gas for various purposes. Some of the more enterprising are trying the system of prepayment by small instalments, or of weekly or monthly, instead of the stereotyped quarterly, accounts; or of supplying the whole system of pipes and fittings, right up to the burner, free of first cost to the consumer, looking for remuneration for the extra expense thus involved, either to a small charge as rent, or to a slight increase in the price charged for the gas. Altogether, the gas consumer of to-day enjoys many advantages that were unknown to his predecessor of twenty-five years ago.

When addressing you last year, I referred to the unsatisfactory state of the science of photometry as the means by which the article we supply is valued on behalf of the consumers. The points to which your attention were then directed have been strikingly illustrated by a paper read at a meeting of the Southern District Association of Gas Managers in November last by Mr. John Methven. You have doubtless made yourselves intimately acquainted with the interesting experimental results recorded in that paper; so it is not necessary to occupy your time by referring to them in detail. They afford a valuable insight into the possible causes of some of the notorious discrepancies in the results obtained by different gas examiners, which have been so remarkable as to originate the sly suggestion that the "wheelbarrow" photometer was introduced as much for the purpose of checking the gas examiners as for giving an extra check on the gas companies. But although, under present arrangements, the accurate valuation of illuminating gas appears to be out of reach, the careful investigations conducted by Mr. Methven are cheering, as affording reasonable hope that this long-sought goal is not impossible of attainment. These investigations show the importance of patient research, not directed to one or two details only, but embracing each and every factor involved, such as the variation in the illuminating effect of a flame that is due to changes of temperature and pressure, to different rates of consumption of material, and to different rates of air supply. Then the environments of the flame influence the result in two ways. They may simply act in a mechanical way as absorbers or as reflectors of light or heat, and also in a chemical way by influencing the direction of currents in the air supply, or the products of combustion, and through these the actual conditions that obtain in the flame itself. Beyond these there is the personal element, as shown by differences in the visual faculties and observing powers of different operators. All these things must be investigated and accurately defined before we can hope to arrive at conclusions that will be accepted as correct by all concerned.

Other subjects claim our attention during the short time at my disposal to-day, but there is one thing that I must pause to strongly insist on. Any new improvements in standard photometrical apparatus must not be so applied as to injure either party. Most of us have a tolerably clear sort of notion as to what 16-candle gas is, although we may be told that it has never been accurately defined. When our friend, Mr. George Livesey, tells us that he has to use 8 or 9 per cent. of cannel coal in order to satisfy the requirements of the examiners, we know at once that he is called upon to supply, not a 16, but an 18 or 19 candle gas, which will cost at least another 3d. per 1000 cubic feet for coal. Many undertakings are worked according to the regulations of the sliding scale; but all are interested in keeping down the selling price as low as possible. While we are quite willing (to borrow a licensed victualler's expression) to supply gas "of the same superior quality as heretofore," we strongly object to any so-called improvement that has the effect of reducing the nominal quality of our gas, and of compelling us to use a costly material, the supply of which appears to be rapidly approaching restriction. Sixteen-candle gas has been made all over England for so many years, that the *modus operandi* necessary for its production is thoroughly well understood; and judged by this standard, the article that has always been known to gas engineers as 16-candle gas must remain a 16-candle gas. It cannot be put back even to 15·5 without inflicting a great injustice on gas shareholders and on gas engineers—on the former as raising their working expenses without offering any equivalent for the increased cost, and as injuring their prospects and the stability of their business by retarding reductions in the selling price; and on the latter as rendering it impossible for them to continue their present statistics of working, and as invalidating a vast amount of data that has gradually accumulated, illustrative of the working results obtainable from various kinds of coal.

It would be a wanton consumption of your time were I, in the briefest manner, to attempt an exposition of the work of the Council during the past year. Suffice it to say that no time or energy has been spared to conscientiously discharge the duties committed to their trust, as shown in the annual report, and exemplified in the proposed Memorandum and Articles of Association now in your possession, and to be submitted for your approval to-day.

An attempt was made last year—and that in a quarter to which readers of papers would naturally look for help and encouragement—to show that the papers read at the London meeting were of an inferior or indifferent order, as compared with those presented at previous meetings. Judging by the light of recent events, the object of this line of argument was to lead up to the inference that the

Institute had been "shorn of its locks" so far as the authors of papers are concerned; and that the seceders from our ranks—the men of "brains"—included most of those who were capable of maintaining the value of the proceedings of the Institute. My object in referring to this matter is to invite a large number of champions to come forward and take up the gauntlet thus thrown down, and to show, as we shall do at this meeting, that the Institute is still able, from its present roll of members, to provide papers and conduct discussions that will carry their own testimony as to their interest or value to ourselves and to our profession at large. It is true that—chiefly on account of the unsettled state of affairs which the present members of the Institute were not responsible for producing—there was a difficulty in getting papers for last year's meeting. Cold water was thrown upon our endeavours to secure papers, as well as upon all other of our preliminary arrangements; and there are those who would not have been sorry if last year's meeting had turned out a complete *fiasco*. The result was that only three gentlemen had the courage to come forward with papers last year; and they are, for this reason, more entitled to the sympathy and support of their fellow-members than the average of paper-readers. Apart from this, however, I cannot but think that anyone who will look at our last year's proceedings without prejudice, must admit that to call the papers read by Messrs. Anderson, Humphrys, and Valon, respectively, something below the usual Institute standard, and only fit for District Associations, is simply an act of injustice to the authors. There can be no doubt that our last year's proceedings exercised an important effect in gas engineering circles, by directing attention to the advantages attendant upon the use of air or oxygen as a means of assisting and facilitating the work of gas purification, and that especially in connection with the use of lime. Many gentlemen have taken up the use of these auxiliaries since our last meeting. Several speakers stated, in the discussion on Mr. Valon's paper, that air might be used, with proper precautions, and in measured quantity, with little, if any, appreciable depreciating effects on the illuminating properties of the gas; and this has been substantiated by the experiments of Mr. May at Richmond, as described by him in his Presidential Address to the Southern Association of Gas Managers, delivered in February last, and by many other gas engineers.

Look, gentlemen, to the list of papers and communications, and tell me whether, in the originality of the subjects, or the scientific and practical position of the authors, such a list has ever been submitted in the past history of the Institute. All honour to the men of "light and leading" who have generously acceded to the request of the Council, and come forward to leave the impress of their knowledge and experience on the pages of our Transactions.

An important event during the year has been the formation of the Institution of Gas Engineers, about which I wish to speak with every possible respect and friendliness, seeing that many of the gentlemen who have taken a prominent part in its promotion were also concerned in moulding The Gas Institute into its present form, and in introducing the rules which they now find to be so objectionable. So the new Institution will start with the benefit of a large amount of experience gained from an intimate knowledge of our own working. I cannot agree with the argument that the new Institution is in no sense a rival establishment—formed with the idea of taking away customers from the old shop, because these words (though they are not exactly those I should apply in speaking of our friends) very fairly represent the endeavours that have been made, by direct personal correspondence addressed to members of this Institute, to induce gentlemen upon our roll to cast in their lot with those who decided to leave us. And in several ways the formation of the new Institution is a decided case of poaching on our preserves. It can have no objects that are not either expressly included in our own, or obviously intended to be included.

There has been some boasting to the effect that certain things will be done better than they can ever be done by ourselves; that the status of the members of the new Institution will be of a superior character to that possessed by many gentlemen now present with us; and that those who attend the meetings will find themselves in a more select company than that present to-day. But I doubt whether arguments of this kind will be likely to lead gas engineers who, as yet, have held aloof from their professional brethren, to select the Institution rather than the Institute. We have yet to see the Institution established in fairly going order. In the event of such being accomplished, there will be rivalry of a certain character; but it need not of necessity be unfriendly. Whilst firmly maintaining our own position, we shall always be glad to hold out the right hand of fellowship to those who are seeking to further the interests of our industry.

The tranquil atmosphere in regard to our every-day operations that we have been privileged to enjoy for several years, has been rudely disturbed. Since the coal famine of 1873, we have enjoyed a fairly favourable coal and labour market. A safe and reliable supply of coal, and reasonable, attentive, and obliging workmen, willing to do a fair day's work for a fair day's pay, have been within our reach. But since I last had the honour of addressing you, difficulties have arisen, both in regard to coal and labour, that are of such importance as to demand our immediate attention. We are under the obligation to maintain a sufficient supply of gas at all times; and it is scarcely less important that the price should not suffer any material increase. It is therefore absolutely necessary that our supply of coal and of labour should stand upon similar grounds; and questions affecting them are of vital importance to us. We may appropriately regard these two matters under one head, because the coal difficulty is simply an offshoot of the labour question. The repeated advances in the price of coal, and the difficulty in getting a proper supply, have been originated simply by the demands for increased rates of wages on the part of the miners, and by strikes resorted to as a means of enforcing compliance with such demands. But coal dealers and others have sought to get some advantage out of this state of affairs. When we are asked to pay 2s. per ton or so additional for coal, on the ground that the miners are to receive an increase of 5 per cent., which means an increase on each ton of 2½d. to 6d., according to locality, extent of seam, &c., we naturally wonder where the remaining 1s. 6d. goes to; and it is impossible to avoid the conclusion that these labour disputes are by no means disastrous, or even undesirable, to the proprietors of collieries. The fact that the public accept the increased price, if not with cheerfulness, at any rate with resignation, must naturally attract the attention of the miners and of those who manage the affairs of their trade societies, and may possibly lead them to form rash opinions respecting the length to which they can safely carry their demands for higher wages.

These continual increases in the price of coal are likely to prove injurious to our industry; and there is also another class whose interest in cheap fuel has not been adequately represented, and that is manufacturers, who are engaged in a neck-and-neck race with foreign competitors. A noticeable feature in the United States, since the discovery of the petroleum wells and of natural gas, has been the remarkable manner in which these supplies of cheap fuel have attracted manufacturers from far and near to the localities in which they are found. A great deal of the manufacturing trade of this country has grown up in a similar manner, upon a supply of cheap fuel; and if the conditions relating to the supply of fuel are altered, much of the trade must necessarily gravitate towards countries where the supply of fuel is cheaper and more permanent. It would be nothing short of a national benefit if, before this sort of thing obtains to an injurious extent, some plan could be agreed upon that would not only satisfy both masters and men, but would also secure for our British industries a reliable supply of coal, at prices not running higher, to any considerable extent, than those that have been prevalent in recent years.

Coming back to our own need of coal, the course of events points decisively to the want of another string to our bow. Whether this will eventually be forthcoming in one or more of the numerous oil-gas and water-gas schemes at present under trial in this country is yet a matter of uncertainty. But we shall do well to keep close attention in this direction. Circumstances in many parts of the United States have rendered it advisable for the manager of the gas-works to be prepared with more than one set of gas manufacturing plant; so that if the supply of gas coal falls short, or the price rises, he can fall back

on water gas, or if his stock of petroleum or anthracite is affected, he can turn to his store of gas coal.

Valuable information respecting this, as well as other points connected with gas engineering practice on the other side of the Atlantic, is afforded by the abstracts of the proceedings of the numerous American Gas Managers' Associations which appear regularly in the columns of the JOURNAL OF GAS LIGHTING. As originally published in the American papers, these proceedings are given at very considerable length. But the condensed reports in the JOURNAL OF GAS LIGHTING are evidently arranged to include all interesting or novel points, while excluding all that is merely of local interest; and thus the reader is enabled to obtain just the information he requires in a concise form.

Although it appears a very general plan in America to resort to water gas as a reserve for extraordinary demands, such as are caused by an unexpected run of dark, cold, or foggy weather, it is difficult to see how such would fit in with the demand for gas of a uniform quality which is usual in this country. Gas-engines, regenerator burners, and atmospheric burners, are remarkably sensitive to variations in the quality and specific gravity of gas. Complaints from the users of this class of apparatus are as numerous as from the users of ordinary batswing or fish-tail jets. And when we are told that the gas consumers in a certain town are willing to accept pure coal gas at one time and a mixture of 30 to 50 per cent. of water gas at another, it is impossible to avoid the conclusion that the American gas consumers are not so particular as English ones, or else that the use of numerous kinds of appliances for utilizing gas as a fuel, or as a source of motive power, is not so extensive in America as in England.

The labour difficulty is perhaps more important than the coal supply, which it so far resembles in that it is not a matter of cost only, but of indifferent workmanship also. Not only have we to pay more for gas coal, but the quality is, if anything, worse than formerly; and on all sides I hear complaints, not only of having to pay more for wages, but of inability to maintain the make per mouthpiece, and generally to keep up the usual standard in regard to the work in the retort-house. There are ominous rumours of men refusing to carry out fair and reasonable instructions issued to them by the manager or foreman. There is the fact that a large undertaking—widely known and justly celebrated for liberal treatment of employees, and consideration of their comfort and welfare at all times—has been compelled to spend some £50,000 or so, in addition to normal expenses, upon the item of wages, in order to carry out its obligations to its customers. The distinct threat implied in the remark that there is more than one November in every year has been repeatedly put forth. A new set of labour agitators has come forward, preaching the creed of "as little work and as much wages as possible" to such extravagant lengths that one may well imagine that the goal at which they aim is represented by certain persons who do nothing, and yet draw large incomes from the Public Exchequer. When one reads the blatant nonsense advanced by these agitators, under the guise of schemes that are put forth as likely to better the condition of the working man, and then turns to the record of the past transactions of this Institute, and refers to the manner in which the claims of the labouring classes have been advocated from time to time from the presidential chair, from the reader's desk, and from the floor of the room, there can be no question as to who is the real friend of the working man.

On the one side, we have the excitable individual who takes up the *rôle* of champion of the horny-handed son of toil—his own hands, by the way, are usually encased in kid of the best quality, lest the sun or the cold wind should mar their delicacy and whiteness. He fell out with steady, regular labour many years ago, after a very brief acquaintance; and the quarrel has been irreconcilable ever since. On the other side, we managers of gas-works and employers of labour have been freely denounced as the working man's enemy—ever seeking to beat down his day's pay and to curtail his liberties—with whom peace is impossible. Of course, we do not discuss questions here in a general or popular light, but only in relation to our own special circle; but I do say, gentlemen, tha tthe working men employed in gas-works have never met with better or truer friends than those included in the roll-call of this Institute. Gas managers have from time to time, as opportunity offered, introduced many benefits and advantages) I will not call them concessions), in many instances entirely without any incitement to do so other than that sense of duty which ought to originate the whole of our actions—such as the introduction of the eight-hour shift (which had been introduced by some gas engineers long before labour agitators had thought of making it a party cry), the partial cessation of Sunday labour, the introduction of bath-rooms, libraries, reading-rooms, and numerous forms of recreation or improvement into the gas-works, and the promotion of clubs, benefit societies, or sick or superannuation funds.

What are the vapourings of the self-dubbed friends of the working man, who usually have some political "axe to grind," or socialistic theory to support, when weighed against these solid advantages? In ordinary trade, the man who sells articles of the best quality at the lowest price is the one that is most successful; and the same holds good in the labour market. It is safe to say that there is not one member of this Institute who would wish to beat down the wages of a competent and industrious labourer or artizan. He would rather pay a liberal sum, sufficient to render that man contented and happy.

Let us assume for a moment that the misguided stokers who lately threw up their work under the belief that they would thus be able to enforce better terms from their employers, had prepared the ground beforehand by carefully studying how to carry on their work in the best possible manner, how to maintain the heat with the least possible expenditure of fuel and injury to the furnace, how to put into each retort exactly that quantity of coal that it was capable of working off, and so on. In other words, that they offered the best possible quality in that particular commodity that they have to sell.

Of course, this is only supposition, for, as a matter of fact, a diametrically opposite course was followed. But could they not have thus rendered their position in respect to their employers very much stronger? We sometimes hear of a managing man in a business, or the superintendent of a special department in a factory, who is said to be worth any money to his employers. They would not part with him, if they could help it, on any consideration. How is it that such an individual has become so valuable? Simply by following the course above indicated, throwing his whole energy into his work, and carefully mastering each detail until he has developed a special degree of talent in one particular direction. Nor do we find that men of this kind are confined to the heads of departments. Such a position is open, though in a more restricted sense, to every subordinate.

This is the only direction in which to look for any really solid or permanent advantage. It is all very well to talk of forcing sales by artificial means, or at artificial prices, whether the commodity be labour or anything else; but such plans can only have one end, whatever may be the fanciful title under which they may be disguised, or the plausible arguments with which they may be supported. The person, or the commodity, that trusts to plans like these, must eventually sink into the position of the tradesman who seeks to sell an inferior article at a high price. Brute force may be successful for a time; but sooner or later the oppressor is labelled by public opinion as an enemy to society at large, and is paid back in his own coin. Perhaps a competitor steps in before him, or perhaps the public coolly dispense with his particular commodity, and will have none of it. The result of excessive wages in our own industry would be to lower profits; thus increasing the difficulty of obtaining the capital necessary for the proper carrying on of our business, by depreciating it in the eyes of the investing public. Excessive wages mean higher prices, and consequently a diminished demand for gas, due to loss of business taken away by competitors who now come forward to share in the supply of artificial light. Out of every additional £1000 expended in gas plant, and out of every 1000 cubic feet of gas sold, the artizan and labouring classes receive a large slice. Manufacturing, purifying, storing, and distributing plant cannot be provided without affording employment to a great many hands. Out of every 1000 cubic feet of gas made, the miner, the railway man, the retort-house hand, the labourer, the bricklayer, the fitter, and a host of others, all draw their share. Anything that decreases the demand for gas, or hinders the

expenditure of new capital, must, therefore, reduce the amount paid away to one and another in the form of wages; and this must eventually act on the individual, through the inexorable law of demand and supply. Or, perhaps, things turn in another direction. The engineer or the mechanician comes forward with his labour-saving device, and shows us how to effect through the medium of machinery as much work with the help of ten men as could formerly be done by a hundred. The interest on the cost of machinery steps in and takes a share of the sum that was formerly paid away in wages. Recent events have afforded a great impetus to the introduction of machinery. It is not only looked upon from the pecuniary point of view, but also as being more reliable than bodies of men, who may at any moment throw down their tools at the bidding of a third and outside party, and that on some matter of so-called "principle," which is entirely beyond the powers of their employers. Witness the strike at Salford, not because of any local grievance, but in sympathy with the employees at a neighbouring works, with which the Corporation of Salford had nothing to do, and over which they exercised no control. Gas companies want none of that sort of "principle," but a little more "interest" on the part of their workmen.

The reference to Salford affords me an opportunity of expressing a fervent hope that the time will come when the heading "Gas Affairs at Salford" will appear less frequently in our periodical literature than it has done during the last few years. I am sure we are all heartily tired of the wordy warfare that has gone on in that borough for so long a time, and would specially appeal to our friends who control the gas press, to consider whether they could not, as a welcome relief, give us just a number or so with no mention of Salford in it.

But what about the immediate future of the labour question? I for one have a strong faith in the innate good sense and good-heartedness of our British working-man, who, after all is said and done, is second to none on the face of the earth. Others may think differently; but let us, when dealing with this question, bear in mind that, although we must, perforce, look at it in a business-like way, and talk of the value and price of labour just as if it were an ordinary commodity of sale and exchange, we are dealing with the only possession of a class of fellow-men who are always keenly alive to sympathy, kindness, and encouragement. The position of master and man ought to be more intimate than that of buyer and seller. Let us, therefore, so far as is consistent with our position, do what we can in the way of showing ourselves the true friend of the working-man.

I cannot conclude this address without a reference to our visit to Paris at the close of last year's meeting. On the invitation of the Société Technique de l'Industrie du Gaz en France, a large number of our members visited the French capital, where they were received with that urbanity and cordiality which characterizes our French brethren. Unfortunately, I was not myself able to take advantage of the invitation; but those of us who did so are not likely soon to forget the kindness and attention they received from their entertainers. International courtesies of this kind are good for us all; and I trust that as years roll on they may become more frequent.

At our last year's meeting we brought the good ship "Gas Institute" and her specie cargo safely into port, since which time she has been thoroughly overhauled and manned by a full crew of experienced hands; but it is for you to say what has been the success of the voyage. In handing the command over to a new pilot, I have only to express my hearty thanks to those who have assisted in navigating the ship during the past year, and wish all hands a prosperous voyage for the year to come.

At the close of the address, the report of the Council (given in the JOURNAL on the 10th inst.) was unanimously adopted, on the motion of the PRESIDENT, seconded by Mr. W. A. VALON.

AWARDS OF PREMIUMS—THE BIRMINGHAM MEDAL.

The PRESIDENT next presented to Mr. T. Newbigging, C.E., of Manchester, the Birmingham Medal, which, he said, had been awarded to him in consideration of the work he had successfully carried out, not only in various parts of this country, but in South America, Africa, and on the Continent of Europe. The medal was not to be prized simply for its intrinsic value, but as the "blue ribbon" of the Institute, which was only awarded once in two years; and it was felt that it could not be bestowed in a better way than to the gentleman whose "Handbook" was being so constantly referred to in parliamentary committee-rooms, arbitrations, and elsewhere, as a standing authority on gas manufacture, and who had also shown his abilities in other directions in science and literature.

Mr. NEWBIGGING said it was very difficult to express in appropriate terms his high sense of the honour which had been conferred upon him by presenting him with the medal; but he could assure the members that its reception would stimulate him to still further exertions in the future, in order to show that he was worthy to possess it. It was very gratifying to observe the strides which had been made in gas manufacture during the last 25 or 30 years; and if he had been at all instrumental in aiding this advance, he was very proud. But there was no doubt much greater progress to be made in the next quarter of a century; and he was rather inclined to envy the younger generation of men, on whose shoulders the task of promoting it would devolve. He was much gratified at the reference which had been made to his "Handbook;" and if it was not so complete as it should be, he could only say that it was not from an intention on his part to keep anything back, but because of the impossibility of committing to writing the experience of a lifetime. He thanked the meeting and the Council most sincerely for the honour which had been conferred upon him.

The PRESIDENT then presented Mr. Valon with the silver medal of the Institute and a cheque for £10, for his paper (read at the last meeting) on the use of oxygen in connection with the purification of gas. He expressed the hope that Mr. Valon and his sons after him might long continue to assist the gas industry by their theoretical and practical investigations.

Mr. VALON having suitably responded,

The PRESIDENT said the next prize, of £7, had been awarded to Mr. George Anderson, who, he was sorry to say, was not present; but it would be forwarded to him by the Secretary. He had known Mr. Anderson for many years; and he had been always one of the foremost men in the profession. The third prize, of £3, was awarded to Mr. Norton H. Humphrys, of Salisbury, who was well known by his writings in the scientific periodicals, and also for his practical work in the laboratory.

Mr. HUMPHRYS briefly expressed his acknowledgments, and the meeting adjourned for luncheon.

The afternoon meeting was held in the smaller hall, as being more suitable for the purposes of discussion. The first business was the reception of

THE REPORT OF THE SCRUTINEERS.

The result of the election of office-bearers for the ensuing year was as follows:—

President.—Joseph Hepworth, of Carlisle.

Vice-Presidents.—William A. Valon, of Ramsgate; and Harrison Veevers, of Dukinfield.

New Members of Council.—C. Armitage, of Lancaster; C. E. Jones, of Chesterfield; A. Mead, of Chelmsford; and T. O. Paterson, of Birkenhead.

Finance Committee.—J. Annan, of Wolverhampton; T. Duxbury, of Darwen; and J. Lowe, of Weymouth.

Auditors.—W. Smith, of Hyde; and T. W. R. White, of Sherborne.

THE INCORPORATION OF THE INSTITUTE.

The meeting was then declared extraordinary, for the purpose of considering the resolution, of which notice had been given, to incorporate the Institute.

The SOLICITOR (Mr. Radcliffe) read the principal points of the draft Memorandum and Articles of Association; offering at the same time to read *in extenso* any clause which might be deemed of special importance. He remarked that the objects of the Institute, as stated in the Memorandum, were very wide—possibly some might think they were too wide; but this had been purposely done, to allow full scope for the development of the Institute in the future, if desired, without the necessity of re-constituting it, as, when once adopted, the Memorandum could not, in the present state of the law, be altered.

Mr. T. DUXBURY (Darwen) moved—"That the Council be, and they are hereby authorized to make application to the Board of Trade for a Licence to enable the Institute to

be incorporated as a Company with limited liability, under section 23 of the Companies' Act, 1867, and to take all necessary steps, consequent upon the granting of such Licence, to procure the incorporation of the Institute accordingly." He said this resolution did not involve the carrying of the Memorandum and Articles as submitted, but merely asserted the principle of incorporation. There were many reasons why this step should be taken—the two principal ones being that it was desirable to limit the liability of each member to the amount of his subscription; and that, as a body corporate, they could sue or be sued in their corporate capacity. There were other minor points. For instance, when incorporated, certain books would be open at fixed times to the inspection of all members. The Council would practically occupy the position of directors in a company, and would be bound to conduct their business in a legal manner; and if they did not do so, they could be brought to book by the members. In the past, being simply a voluntary society, this was not so. The officers would also be amenable to the law; and the members would have the further security that the Board of Trade would have the right at any time, on the petition of the members, to send an Inspector to hold an inquiry, and examine the members, the Council, the officers, or anyone else, upon oath. The Council were thoroughly united in proposing this course to the members.

Mr. C. E. JONES (Chesterfield) asked if the meeting was then in committee.

The PRESIDENT said that it was not. When the resolution had been seconded, he should be glad to hear any observations from Mr. Jones or anyone else.

Mr. VALON thereupon seconded the motion.

Mr. JONES said he should have been willing to second the proposition submitted to them, as it was very similar to one he moved at the Birmingham meeting in 1881; and he only regretted that the Council had taken so long before following his advice. He should like to know, however, if the word "limited" was to be eliminated, as was usual in such cases; and he also thought the age fixed for associates—eighteen—was too young. He should like to see it changed to twenty-one. He also thought it would not be possible, according to law, to deprive extraordinary members of the rights they now possessed by the vote of a majority. They had voted hitherto; and, as far as he had seen, they had exercised that power with discretion, and in the best interests of the Institute. Why they should now be deprived of these rights, he did not understand; and he rather thought the Institute was attempting to legislate in a panic.

The PRESIDENT called Mr. Jones to order. The question he was raising would, he said, more properly came before the meeting in connection with a subsequent resolution.

Mr. DUXBURY said the elimination of the word "limited" would come forward in due course, on the question of registration.

Mr. G. BRAY (Leeds) said he must at present oppose the motion; but if Article 52 were altered, he should probably withdraw his objection. He much regretted having to oppose the proceedings at this stage; but he was advised that it was necessary for him to do so.

Mr. S. R. OGDEN (Blackburn) asked if the Institution of Civil Engineers were under the Limited Liability Acts.

The SOLICITOR said that body was incorporated by Royal Charter. If The Gas Institute applied for such a Charter, which was a very expensive proceeding, they would most probably not succeed. He had opposed a Charter being conferred on the Institution of Mechanical Engineers and on the Institution of Telegraph Engineers; and in each instance the Home Office had declined to grant one. If the resolution were carried, and a Licence were issued by the Board of Trade, the word "limited," would not appear in the title.

Mr. D. BRUCE PEEBLES (Edinburgh) suggested that it would be desirable to discuss Article 52 at once.

The PRESIDENT ruled that this would be out of order. Every opportunity, however, would be given for discussing it later on.

The motion was then put to the meeting, and carried with one dissentient.

The PRESIDENT said he would direct the Secretary to record that Mr. Bray had voted against the resolution.

Mr. DUXBURY next moved—"That the Memorandum and Articles of Association contained in the printed document which has been submitted to this meeting (and which, for the purpose of identification, has been subscribed by the Chairman thereof) be, and the same are hereby approved, subject to the manuscript alterations and amendments in the same which have been initialled by the said Chairman; and that such Memorandum and Articles of Association be, and they are hereby adopted as and for the Memorandum and Articles of Association of the Institute when incorporated, subject to any variations, alterations, or additions that may be required by the Board of Trade; and that, from and after the date of the incorporation of the Institute, the same, subject to such variations, alterations, and additions (if any), be substituted for the existing rules and regulations of the Institute." He said he thought it would simplify the matter if he were now to go through the various clauses *seriatim*; allowing any member to object or propose an alteration in any clause as it arose.

On Clause 1 of the Memorandum, giving the title,

Mr. C. E. JONES objected that the word "Institute" was not a grammatical one. It should, he said, be "Institution," as was adopted by the Institutions of Civil Engineers and Surveyors.

The PRESIDENT said he was sorry to differ with Mr. Jones, who was Chairman of a School Board; but he did not think his objection was a valid one.

The SOLICITOR having defended the use of the word "Institute," and quoted precedents for it,

Mr. JONES said he would not press the point.

The rest of the Memorandum was then gone through, and agreed to.

Mr. DUXBURY next proceeded with the Articles of Association, which, he said, were not drawn with any idea of winding up the present Institute, and starting afresh, but for the purpose of carrying it on as an incorporated society.

No comment was made until Article 6 was reached, which excited a great deal of discussion. As drawn, it read thus—

> Members shall be either engineers, managers, or secretaries of gas undertakings (the latter being exclusively employed as such), and gas engineers solely employed as consulting engineers, and not engaged as principals or agents for any trading or manufacturing firm.

Mr. JAMES LEES said he thought this would tend to reduce considerably, instead of increasing, the number of members; and, especially in connection with Article 8, which relegated members, under certain circumstances, to the class of associates. He thought it very objectionable. There were men who had been valued members for many years—he had one in his mind who had been 21 years a member, and another 18 years; and he would suggest an alteration to the effect that members "shall be, or shall have been," engineers, managers, and so on, at the same time excluding principals or agents of manufacturing firms. On the programme for the present meeting were six papers from gentlemen who were not directly gas managers.

Mr. DUXBURY pointed out that Mr. Lees's remarks applied more to Articles 8 and 52. Article 6 only referred to members to be hereafter elected. Did he mean that in future they might elect anyone they pleased?

Mr. LEES said he would move, as an amendment, the substitution of the old Rule 3 for Article 6.

Mr. C. E. JONES seconded the amendment. He said it was all very well to talk about the rule being prospective. But directly they were incorporated, it would be open to any member to go to a Court of Law and call upon the Council to carry out the Articles of Association; and then sentimental considerations would not be listened to. He should be very sorry to see gentlemen like Mr. Sugg, Mr. West, Mr. Newbigging, the President, and others he could name, when they retired from active duties, relegated to the class of associates.

The PRESIDENT said this point would come up in connection with Article 8.

Mr. T. H. MARTIN (Barnet) here pointed out that Mr. Duxbury's resolution was not seconded.

Some discussion ensued as to the form of procedure; and it was decided to submit the Articles one by one. Nos. 1 to 5 were put, and agreed to.

On Article 6 being brought forward,

Mr. LEES moved, as an amendment, that the old Rule 3 be substituted for it.

Mr. JONES seconded the amendment.

A MEMBER asked whether, if Article 6 were passed, retired gas engineers would have to become associates.

Mr. DUXBURY said they would not; this was dealt with by Article 8.

The amendment was then put and rejected by upwards of 50 votes to 8; and the article was thereupon adopted.

At this stage of the proceedings, Mr. Jones rose and left the meeting.

Article 7 having been agreed to,

Mr. DUXBURY moved Article 8, which ran as follows:

In the event of any member or associate member ceasing to hold the necessary qualification as above described, his membership shall immediately cease; but he may, if he so elect, be placed in the class of associates.

He said this was no doubt an important rule; but it was one the Council thought ought to be adopted. The Institute was originally called the British Association of Gas Managers; and while they had since allied with themselves others who were interested in the profession, they wanted, as far as possible, to have the government in the hands of managers of gas-works, for whom the Institute was originally intended. It was therefore thought that the future members should only be those who held such a position. This was the practice in the Manchester District Institution of Gas Engineers, of which none but managers or engineers could be members. If a man left the profession and went into the coal or the meter trade, he should certainly not be retained as a member, but should be an associate of The Gas Institute.

Mr. HEPWORTH seconded the motion. He said he had listened with attention to the points put by Mr. Lees, but thought such gentlemen as those he had referred to might be elected honorary members.

Mr. JOHN MILES (Bolton) asked if this article would be prospective and not retrospective. On finding that it would operate on those at present connected with the Institute, he protested against what he considered the degradation that would be inflicted on many old and valued members.

Mr. D. BRUCE PEEBLES said this was a retrograde movement, not at all in accordance with what was being done in other scientific bodies.

Mr. A. THOMAS and Mr. LEES having spoken in opposition to the article,

The PRESIDENT appealed to the members to act with unanimity, and pass the articles.

Mr. W. SMITH (Bolton) thought that members might appeal to the Council to act in unanimity with them, and not commit what many considered to be an injustice.

Mr. MILES said his view was that all present members should be retained in the position they now occupied.

The SOLICITOR suggested the addition of words providing that the article should not apply to any member now holding the necessary qualification, and whose name should appear in a schedule.

Mr. MILES thought this would meet the difficulty.

Mr. W. R. CHESTER (Nottingham) pointed out that Article 6 was intimately connected with this question.

Mr. DUXBURY said it was not the desire of the Council in any way to steal a march on the members by getting one article passed, which was afterwards found to be affected by a subsequent one; and they would have to make some alteration in Article 6 if Article 8 were modified.

Mr. A. THOMAS (Cowes) thought a manager who retired without going into another business should remain a member; but if he went into ironmongery or any other occupation, he should, it seemed, be called upon to resign his membership.

A long discussion ensued, in which Messrs. C. Hutchinson (Barnsley), P. Simpson (Rugby), A. Edwards (Taunton), and others took part. In the course of it, the Solicitor suggested that Article 8 should be omitted, and Article 6 amended, as Mr. Lees had previously proposed; and several members expressed their approval of this course.

Mr. J. M'GILCHRIST (Dumbarton), as a member of the Council, said he had never contemplated that Article 8 would affect present members, or he would not have voted for it. He did not think the suggestion made would quite meet the case. It would be better to alter Article 8, so as to make it apply only to prospective members.

Mr. WHYTE (Seaham Harbour) suggested that the words "hereafter elected" should be inserted in Article 8.

A further discussion ensued, and ultimately,

Mr. MILES moved, seconded by Mr. M'GILCHRIST, and accepted by the Council, that both Articles 6 and 8 should be amended by inserting the words "who shall be hereafter elected," and by adding at the end of each: "In special cases the Council may direct that this rule be relaxed."

In their amended form, Articles 6 to 8 were then put, and agreed to unanimously.

Articles 9 to 52 were then submitted *seriatim*, and agreed to, with scarcely any comment. On Article 24, relating to the annual subscriptions,

Mr. PEEBLES moved an amendment to the effect that extra-ordinary members elected in or prior to 1877 should not be called upon to pay more than one guinea subscription.

Mr. LEES seconded the amendment; but it was negatived by a large majority.

Article 52 ran as follows:

Every member shall have one vote; neither extra-ordinary members, associate members, associates, nor honorary members shall have any vote, nor shall they be entitled to speak or take any part in any discussion, except upon the reading of papers or other scientific business of the Institute. No member whose subscription is in arrear shall be entitled to vote.

Mr. DUXBURY said there would be no objection on the part of the Council to accept an amendment of this clause similar to those made in Articles 6 and 8, so that it should be prospective only in its operation.

The PRESIDENT hoped what had been said would be satisfactory to Mr. Bray and his friends.

Mr. BRAY asked whether the concession would apply to speaking as well as voting.

The PRESIDENT said he took it for granted that anyone who was at present an extraordinary member would stand in precisely the same position in future as he did now. The Solicitor would put it in the proper form.

Mr. BRAY thereupon expressed his great gratification at the decision to which the Council had come; it was, he said, the one thing required to heal all the irritation which had existed for the last few years.

The remaining articles were then agreed to; the only alteration made being in Article 56, in which words were inserted providing that printed copies of the papers read should be distributed to the members present at the annual meetings, so as to afford greater facilities for discussion.

The SOLICITOR then submitted Article 52 as amended:

Every member and every extra-ordinary member elected previously to the incorporation of the Institute as a Company with limited liability, shall have one vote. Neither extra-ordinary members, associate members, associates, nor honorary members elected subsequently to such date shall have any vote, nor shall they be entitled to speak or take any part in any discussion, except upon the reading of papers or other scientific business of the Institute. No member whose subscription is in arrear shall be entitled to vote.

Mr. BRAY moved the adoption of the article as amended.

Mr. PEEBLES seconded the motion, and it was carried.

Mr. DUXBURY then moved the general resolution adopting the whole Memorandum and Articles of Association as amended and initialed by the Chairman.

Mr. HEPWORTH seconded the motion, and it was carried unanimously.

This concluded the business of the afternoon. Before the meeting broke up, however,

Mr. HEPWORTH said he had only just been made aware that he had been elected President for the ensuing year, and asked permission to thank the members for the honour they had conferred upon him. He felt that it was due rather to their kindness than to his own qualifications; and he could only hope that during his tenure of office, he might be able to follow the best precedents of former times. He would at any rate promise to do his utmost to serve the Institute during the coming year.

The meeting then adjourned.

In the evening, a Smoking Concert was given, in the Town Hall, by the Mayor and Corporation, who did everything in the most liberal spirit to ensure the comfort and enjoyment of the members and visitors.

The proceedings were resumed at ten o'clock on Wednesday morning.

A DONATION TO THE BENEVOLENT FUND.

The PRESIDENT, on taking the chair, read a letter he had received from the Vicar of Ryde, enclosing a cheque for one guinea for the Benevolent Fund of the Institute.

READING OF PAPERS.

The PRESIDENT then called upon the Secretary to read the following paper, in the absence of Mr. T. Newbigging, who had been obliged to leave for London :—

DIFFICULTIES IN TANK CONSTRUCTION.

A narrative of difficulties encountered and overcome is always interesting, besides being instructive and useful. Having this in mind, I thought that a profitable half hour might be spent in recounting the difficulties I had lately to contend with in the construction of a concrete tank. The story is a simple, straightforward one. I tell it more for the encouragement of young engineers, who in their work may have difficulties to contend with, than from any novelty of situation it contains. It will probably awaken reminiscences of similar troubles experienced by others; and it should lead to a discussion of a valuable character on this important branch of engineering practice.

The gas-works on the premises of which the structure had to be built are situated on what I might designate the "flats," or low ground, not far distant from the present estuary of one of the largest Lancashire rivers. Without doubt, at one time (how long ago it is not possible to say) the whole of the land hereabouts was under the water of the same estuary, which has gradually become contracted to its present width. The ground in the locality is, geologically speaking, of comparatively recent formation, consisting first of 18 inches of soil, succeeded by a layer of peaty vegetable deposit 10 feet in thickness. This is just like a thick carpet, springy to the tread, and saturated with water, which is retained in its interstices precisely in the way that water is absorbed and held by a sponge. The fact that it retained the water was so far advantageous to the work, inasmuch that at no time was much trouble experienced with the presence of any large influx of water into the excavation. Underneath this layer of vegetable matter was a bed of blue silt, locally called "white ore," 18 feet thick. On reaching this our difficulties began; for no sooner was it laid bare and exposed to atmospheric influences, than it softened and ran like melted butter. But this is a digression from the order of my story.

On being consulted by the Gas Committee, the question arose as to whether a cast-iron tank standing partially above the ground level, or whether a brick or concrete tank wholly in the ground, should be adopted. I had previously glanced at the situation, and scarcely liked the idea of an iron tank. There was already, on another part of the site, a cast-iron tank, which had contracted a curious habit—an objectionable habit in a tank—of floating about, or tilting over from one side to the other. At one time it would be 3 or 4 inches out of level to the right; at another time it had changed its mind and stood as level as a die. But the latter was only a passing mood; for, on examining it a little later, it was found to have lurched over several inches to the left. Looked at from a philosophical point of view, the phenomena which this tank exhibited were interesting as a study. A tilting tank, however, as you will all admit, is not desirable from a gas manager's point of view, and especially if it happens, as was the case here, to be the only tank and holder on the premises. As a curiosity, it was everything that could be desired; but its antics were a sore grief to the manager, and the fear of a mishap was always present to his mind. It became his "Old Man of the Sea." He looked at it askance at intervals during the day; and on retiring to rest at night, he would dream that it had jumped on him as he lay asleep, and held him in its clutches like a nightmare. The fact is, the structure rested on the spongy, peaty layer which I have described; and hence its unstable condition and erratic movements.

Before making up my mind as to what class of tank should be adopted, I had borings made of the ground; and after piercing through 28 feet of the soft strata mentioned, we reached a bed of solid clay. Thereupon, my recommendation was that a concrete tank, 28 ft. 6 in. in finished depth, should be constructed. The Committee, like sensible men, accepted my recommendation, and empowered me to prepare the design, and see to the work being carried out.

The contract having been made, the first thing was to sink a trench 12 feet wide all round the circumference and close-timber both sides of the excavation. This was done to about half the depth only, as, from the nature of the ground, it was considered unsafe to go to the full depth at once. The vertical shoring timbers were 7 inches wide by 3 inches thick; the double walling-pieces, 3 feet apart, were 11 inches by 3 inches; and the struts were 9 inches by 6 inches in cross section. To prevent the blue silt from oozing through between the vertical timbers, a quantity of hay was used in caulking the joints.

Seeing, as I have explained, that it would be risky to open the trench to the botton all the way round, I decided that the wall should be put in in sections. This was accordingly done. A sixth part of the circumference was opened up right down the full depth. The concrete was built up to a height of 12 feet. Then the next section was similarly dealt with, and so on till the circle was completed. Every section as it rose was carefully shored from the ground left in the centre, and backed with sharp sand, that settled down like a wedge behind the wall.

It might seem an objectionable thing to thus build up the concrete wall in sections. So it was, unless great care had been exercised. In the first place, the wall was not sufficiently strong in itself (the circle not being completed) to resist the pressure of the semi-liquid and moving mass behind it. It was only the careful timbering of the wall behind, and the shoring of it in front from the centre mound, that admitted of its being done. Again, in adopting this method of construction, there is always danger of unequal settlement in the different sections, resulting in cracks and fissures. This was avoided by taking care to thoroughly "pun" or pound the layers of concrete as they were deposited. When the complete circle was thus finished in sections to a depth of 12 feet, the remainder of the wall, to its full height, was put in by adding continuous layers all round. At certain points, where there was reason to apprehend danger in drawing the shoring timbers from behind the wall, these were left in position. The value of this timber not recovered was £230. The ground inside was then removed, the bottom concreted, and the whole of the inner surface coated ½ inch thick with a rendering composed of equal parts of Portland cement and sand, afterwards skimmed with neat cement.

The poor contractor, I am sorry to say, lost several hundred pounds in carrying out the work. And here I may mention the fact that, in all my experience of masonry tank building, I have never known the contractor to make money out of it. I account for it largely in this way: When work of this kind is advertised, there are always a number of new men—men new to the work of tank construction—ready to tender. These, being without experience of the risks and difficulties, put in a low figure; and it being the rule to accept the lowest tender, providing the person tendering has anything of a reputation, the contract terminates in a loss.

The clerk of the works whom I appointed to see to the proper carrying out of the contract was a plain, practical man. I do not think he knew anything of the differential calculus, even if he had ever heard of it; but the theory of strains seemed to be a part of his constitution. Squaring the circle is admitted to be a most difficult operation, and one that tries the capabilities of the most ingenious mathematicians; but that he squared that particular circle, I am prepared to vouch with all my power. He was a veritable Mark Tapley of a works clerk. The greater the difficulties, the lighter his spirits became, and the higher his hopes ascended. A man of that kind is simply invaluable to an engineer. Some clerks of works I have known (though this remark does not apply to any of mine, I am happy to say) take a delight in magnifying troubles. They look only at the dark side of things; and the expression of their countenance at any slight mishap is enough to drive one into despair. Not so my man. The more harassing the difficulty, the pleasanter he looked. His "bright smile haunts me still." He lodged in a house within half a stone's-throw of the work; and, as he told me himself, he used to take pleasure in lying awake at night listening to the creaking and straining of the timbers in the trench. Every now and then a crack as of a rifle shot, caused by the splintering of the tough wood, woke the echoes of the night; but he knew that the struts were there and doing their duty, and that this was only their way of letting him know that they were "on the job." He had other excellent traits in his line; for he always talked of cement, concrete, puddle, and bricks and mortar, as though they were his brothers and sisters.

Meanwhile, as the work proceeded, our old acquaintance

the cast-iron tank, contiguous to the new work, was continuing its absurd vagaries, only more so, because there was a slackening of the spongy foundations underneath it. First it lurched over to one side, then over to the other. I was strongly inclined to chain it to the spot to prevent its running away with the holder; but Mark Tapley promised to keep a close watch upon it. A dancing dervish of a tank is not desirable, however unique its performance. Who knows but some morning it might be found trying to stand on its head! The force of example, however, is wonderful. Now that there is a sedate and stable concrete structure alongside of it, our mercurial friend in cast iron, having sown its wild oats, appears to have settled down into a sedate and sensible tank also, and promises to do good service for many a year. As a matter of fact, the new construction has consolidated the ground in its neighbourhood, and so improved its understanding.

In strict justice, my clerk of works deserved a present besides his wages when the job was finished, because his bright and ready common-sense, and his rare aptitude saved the expenditure of scores of pounds. But he got none from the authorities, I am sorry to say. A local body, unlike a human and corporeal entity, cannot give presents; and this, no doubt, accounts for the omission. To be sure, I handed him a *douceur* in a kind of shame-faced way that it was so small an acknowledgment of his worth. Never mind, he had his reward. The tank, when it was filled to the brim with water, proved to be as tight as a bottle.

Discussion.

The PRESIDENT, in inviting discussion, said the moral of the paper was to be sure of having a good foundation on which to raise any superstructure. Some 35 years ago, when at Portsmouth, he was sent for to Ventnor to advise as to a 6-inch governor which was out of order. When it was erected, it had a brick foundation; but he found this had been removed, and it stood on a four-legged stool. The foreman said this was very convenient, because when it sank a bit on one side they sawed a piece off the leg on the opposite side, and so brought it level. At the same works, Mr. Alexander Wright and himself on one occasion superintended the getting of a station meter through a doorway. They tried every way they could think of one afternoon, and could not get the meter through; but when they went down the next morning, it rolled in easily enough. At the same works a whole stack of retorts sank 3 inches in one day; and it cost about £3000 to build a sea wall to keep out the water. When a tank was constructed at Ventnor, they thought that they had a good foundation on what was called the "blue slipper." When dry, it was as hard as a rock; but when water found its way to it, it slipped. This was a 61 feet tank; and when he went to see it on one occasion, he discovered it had slipped over just half-way down horizontally, owing to the water having reached the blue slipper and produced pressure behind it. It cost £600 to put the tank right. Again, in Ryde they were making a tank 71 feet in diameter; and when they had got down 15 feet, he found they could go no further. The ground was one-third running sand, one-third a 2-inch stratification of stone, and one-third clay. He had some good Portland cement concrete put down; and he did not think the tank had ever leaked from the moment it was made, for it was always full. This showed the value of good concrete; and if it could be put down right, it would stop these difficulties. Running sand was a great trouble. He once had to build a tall chimney, and was obliged to go down 22 ft. 6 in. before he came to solid rock for a foundation; and he had to fill the whole of it up with concrete before the chimney could be constructed.

Mr. MILES remarked that Mr. Newbigging did not say how he got rid of the vast quantity of water which he must have had to contend with, nor what effect it had on the surrounding ground when he had succeeded in doing so. One of the most interesting points in the paper was the reference to the "Mark Tapley" clerk of the works; and he thought his name ought to be given, for his services were certainly worthy of world-wide recognition.

Mr. HARRISON VEEVERS (Dukinfield) then read the following paper:—

ON THE MANUFACTURE OF SULPHATE OF AMMONIA.

Although in these days the primary object of the destructive distillation of coal is to obtain an illuminating gas, yet it is interesting to learn that the first British patents in connection with the gas industry were for what are now considered residual products—the question of the production of gas being conspicuous by its absence. The first patent registered was by John Joachun Becher and Henry Searle, in 1681, for "A new way of makeing pitch, and tarre out of pit coale, never before found out or used by an other." The second was one in which Martin Eele, Thomas Hancock, and Wm. Portlock, in 1694, had a grant of "especiall lycence" for a similar purpose. The *modus operandi* is described as "breaking, grinding, and boyling roch or roofe stone" (so that the plan adopted would scarcely be considered as destructive distillation), until, in 1716, Talbot Edwards proposed to obtain the "pitch, tarr, and oyl by fluxing with fire only." In 1781 there is the first mention of a volatile alkali (which would be ammonia) in a patent taken out by the Earl of Dundonald, the father of the celebrated naval commander, who describes his invention as "a method of extracting or making tar, pitch, essential oils, volatile alkali, mineral acids, salts, and cinders, from pit coal," by a process similar to the present method of making hard coke; but no importance seems to be attached to the volatile alkali. Ten years afterwards, John Barker took out the first patent for the production of "inflammable air;" and it is somewhat surprising to learn that the object of this invention was to obtain motive power, and not light. This is virtually the first gas-engine invented; and another patent was taken out in 1794 by Robert Street for a similar purpose. In both cases gas and air were exploded in a cylinder.

Very obscure references are made in these early patents to the uses of the distillates. In one, the inventor states: "The tar, oil, and volatile alkali is distilled from schystus," and its uses were for "destroying and expelling garden, field, and house vermin, and in the preserving of sown seeds and plants from being eaten by vermin." The first specific patent for treating crude ammonia was taken out in 1837 by George D. Midgley and John Howard Kyan, 34 years after the well-known Winsor had patented his method of distilling coal to procure a gas to produce light and heat, also "for encreasing and multiplying force and power."

It would appear that the early gas engineers considered the tar and liquor as intolerable nuisances. To dispose of them was a serious matter. Turned into water-courses, fish and cattle were destroyed; the ammonia was uninflammable, the tar was unsaleable. So to get rid of these products, land was rented away from the gas-works, deep holes were sunk, and the tar and water buried, to the bewilderment, perhaps, of future geologists. Works near the sea had submarine pipes laid to convey the fluids away from land. There was then the anomaly of two sets of inventors distilling coal, each seeking one description of product and discarding the other. Our earlier engineers were too much concerned with the mechanical problems in the way of producing gas to be able, if indeed they were capable, to study the chemistry of their business. But in time chemistry kindly taught the profession the pecuniary advantages of the bye-products. It taught that by distillation tar yielded a wealth of marvellous colours and scents —indeed, that all its derivatives and its *caput mortuum* were of value in increasing revenue, so as to reduce the price of the prime product, gas; and that it included in its composition combinations of such complexity and number as to afford almost endless variety. An account of the chemistry of tar products alone would now fill more volumes than the chemistry of all organic and inorganic substances half-a-century ago. Nor has the sister residual—the crude ammoniacal liquor—been neglected by the vigilant attention of chemical science, though not yielding such manifold results. Owing to the complexity of the treatment of tar, and to its more dangerous nature, most gas authorities dispose of it in its crude state; not so, however, the liquor. The very simplicity of the process, and the safety of the manufacture, are inducements to the gas manager to undertake the work of making sulphate, particularly when the gas-works are remote from the works specially devoted to the industry, and the conveyance of the liquor is expensive.

Broadly speaking, there are three processes for converting the ammonia of gas liquor into sulphate of ammonia. The writer's earliest experience of the first system at gas-works was about forty years ago. The gas-works were near the centre of a large town; and one is surprised at the forbearance of the residents in allowing the manu-

facture of the salt to be carried on in their midst. In the gas-works was a large brick building with massive walls 5 feet thick. This had been erected to contain a gas-holder; the intention being that, in the event of an explosion, the sky rather than the earth should feel the dire effects. With advancing knowledge, however, gasholders were erected in the open; and this building was utilized for the manufacture of sulphate of ammonia. Pans of wrought iron were ranged on two sides of the room; each pan having its own furnace. The liquor, mixed with sulphuric acid, was heated, and water and sulphuretted hydrogen evaporated until the combined acid and alkali were sufficiently concentrated and salts of sulphate of ammonia were formed. The crystals were "fished" out with wooden ladles, and a black dirty-looking salt was the result. But who can describe the abominable smells given off during the process? It is charitable to assume that the olfactory perceptions of the people of that period were not so keen as those of the present. Complaints, however, must have been made; and the nuisance was somewhat abated by the pans being covered, and the fumes inhaled by a fan and driven through purifiers charged with oxide. But the salt was not satisfactory in appearance, and the waste of fuel was great.

The second step in the mode of manufacture was to drive off the ammonia and other gases by heat applied to a still. This still was generally a circular one with a dome. A fire having been lighted in the furnace, the gases driven off were conveyed to a thick lead or wooden lead-lined saturator charged with sulphuric acid, which, of course, united with the ammonia, and the sulphur gases were conveyed to the furnace, converted into sulphurous acid gas, and so carried away. By this plan, only the volatile ammonia was driven off; and any ammonia fixed to acids derived from sulphur, chlorine, or carbon was lost, unless released by the intervention of lime, soda, or other alkali. The addition of lime, even, was, however, of questionable value, owing to the cost of it, and of the labour in keeping the material well mixed. The two faults of this system were its cost in fuel and its risk. If the still were not carefully examined periodically, there was a danger of the neck being choked with carbonate of ammonia, and an explosion occurring.

The third and most modern plan of making sulphate of ammonia no doubt derived its origin from apparatus used in distilling alcohol; and Æneas Coffey, of Dublin, who patented his celebrated still in 1832, may be considered the forerunner of all the inventors of the present continuous plan of distilling ammoniacal liquor. To this still, to the scientific use of lime, and to the regenerative use of the heat, may be ascribed the success of the present method. It may be remarked that if the judicious use of lime, magnesia, or alkali is of economical importance, it has to be so applied as not to cause an incrustation in the vessels employed, nor in such quantities as to be wasteful of lime, or on the other hand of fixed ammonia. After the introduction of the Coffey still, and the economical use of lime, the great merit of the present system is the adoption of the regenerative principle so useful in many ways in the gas industry. Its application is simple and ingenious. The first point to be remarked is that the heat is applied in the form of steam of low pressure; the heated vapours leaving the saturator are utilized to warm the incoming crude liquor to such an extent that the bulk of the free ammonia is driven off without any expense in fuel. This plan of making sulphate has been so often described, and is so well known to the profession, that further description is not required. It is difficult to imagine how further improvements can be made in the distillation of ammonia, though in the after treatment of the salt mechanical assistance has been required. In the pan system, the salt was fished out direct; in the still plan, the saturator was of necessity introduced, and at first the contents were run into vats or wooden cisterns—the mother liquor, after the removal of the salt, being ladled or pumped back into the saturator. This is, in fact, the before-mentioned patent of Messrs. Midgley and Kyan, in 1837, who state that, after the free ammonia and that liberated by lime were united to dilute sulphuric acid in a saturator, "the salts produced are to be crystallized by evaporation in suitable open vessels." By this plan, the sulphur gases generated by the distillation would be conveyed to the furnace; but the expense of fuel for the still, and afterwards for the evaporating vessel, would be considerable. Subsequently, however, the saturator was improved by being made with a sloping bottom, so that the salts when formed, being of greater specific gravity than the liquor, passed under an apron to the front, and from there were "fished" or lifted out (by means of copper or wooden ladles pierced with holes), placed on a drainer, and then conveyed to the store.

Up to this point of "fishing," further improvements, except in minor points, seemed impossible; but any visitor to a sulphate manufactory must have noticed the slow, laborious work of fishing out the salt—an occupation detrimental to the health and clothing of the workmen, often injurious to their eyesight, and expensive to the manufacturer. As mechanical labour is cheaper and more manageable than manual, and the nature of this work is mechanical, efforts have been made to transfer the salt from the saturator to the drainer by machinery; but to do this on the principle of a river dredger would be clumsy and expensive, and machine power is not always available. But the steam ejector has been adapted to this use, and Mr. Wilton, Engineer of the Chemical Department of the Beckton Gas-Works, has, after many trials, been so fortunate as to solve the problem presented in the department of the manufacture of sulphate of ammonia. Having been interested for so many years in the business, the writer sought, and at once obtained, permission to see the plan in use at Beckton; and was so pleased with its simplicity and utility, that he determined to bring the subject before his brother engineers. The plan, which Mr. Wilton has very properly covered by a patent, is as follows: The salts, when formed and gravitated to the front of the saturator, are lifted by the action of a steam-jet on to the drainer, from which the surplus moisture is conveyed back to the saturator by gravitation. Such, in brief, is the principle; but, in settling the details, considerable thought and many experiments were required. *

At Beckton the apparatus was raising the salt from four combined saturators without manual work, and in much less time than would be required by hand labour; so that the economy was self evident. This invention is the crowning improvement in the manufacture; and to visit a sulphate-house fitted with this and other mechanical contrivances, is a surprise to one accustomed to the old methods. The sulphuric acid is conveyed by a steam ejector from an underground to an overhead cistern, from which it descends by gravitation to the saturator; the lime is dissolved by steam and sent to its work by a steam ejector; and now, by this invention, the salt is removed by a similar contrivance. The process is automatic, and requires only the attention, not the labour, of the attendant; the only labour required being in removing the salt from the drainer to the stores.

Mr. Wilton having been asked for statistics respecting the results of working the process, writes from Beckton on the 4th of June, 1890, as follows:

> The discharger at work here has been going continuously day and night since about November last without any repairs or trouble of any kind. It is fitted to a set of four saturators joined together by pipes, so as to collect the sulphate into one general tank, from whence the salt is taken up by the discharger and delivered a distance of about 20 feet on to a drainer. The amount of sulphate lifted each day is 26 tons, and the total quantity lifted by this apparatus since the start in November last is 5000 tons. Owing to the saturators being free from ammonia salt at all times, I have been able to increase the work very nearly 20 per cent.—that is to say, from 10 tons per still to 12 tons 2 cwt.; a small portion of which (about 5 cwt.) is due to other causes, making a net increase of nearly 2 tons. The labour has been decreased by two-thirds; and when the dischargers are at work all through the house, I expect to reduce it still more. At present I have only one man each shift, doing the 26 tons, in place of three, and sometimes four men.

There are so many excellent works on ammonia and its compounds, and the subject of the manufacture of sulphate has been brought so often before The Gas Institute and kindred Associations, that the writer, not to occupy the time of the members by unnecessary recapitulations, will add a list of books and papers, so that members may be able to refer, without trouble, to the originals.

Works on Ammonia.

An article in "King's Treatise on Coal Gas," edited by Thomas Newbigging, Esq., C.E., Vol. III., p. 256 (1882).

"Coal Tar and Ammonia," by Dr. Lunge (second edition, 1887).

"Ammonia and Ammonium Compounds," by Dr. Arnold, translated from the German by Dr. Colmon (Sampson Low and Co., 1889).

* This invention was described and illustrated in our "Register of Patents" on the 6th ult. (p. 838).—Ed. J. G. L.

[This book is useful, not only for its information and plates, but at the end is a list of recent literature, British and foreign, and English patents, during the past 20 years. In alluding to these books and patents, I would remark that it would be of great value to managers and to students of gas manufacture if The Gas Institute and the local Associations possessed libraries of works on the technicalities of the gas profession, and copies of patents bearing on the industry.]

The following papers bearing on the subject appear in the Transactions of The Gas Institute:

"On Manufacturing Sulphate of Ammonia in Small Gas-Works," by Mr. J. Eldridge, 1871, p. 47. [This describes a system now antiquated.]

"The Estimation of Ammonia in Gas Liquor," by Professor Foster, 1879, p. 99.

"Modern apparatus for the Manufacture of Sulphate of Ammonia," by Mr. W. Hindson, 1882, p. 168.

"Methods of Manufacturing Sulphate of Ammonia and the Adaptability of the Apparatus to the Production of Caustic Ammonia," by Mr. F. D. Marshall, 1882, p. 174.

[The reading of these last-mentioned two papers was followed by a long and interesting discussion, in which Professor Foster, amongst others, took part.]

"Claus's Ammonia Process of Gas Purification," by Mr. C. Hunt, 1886, p. 84. [The discussion on this paper was enriched by the remarks of Professors Heaton and Foster.]

"Croll's Process of Sulphate Making," by Mr. George Anderson, 1887, p. 77.

The following papers, with discussions, are recorded in the Proceedings of Associations of Gas Engineers and Managers:

"Notes on Ammoniacal Liquor," by Mr. J. H. Cox, jun., read before the North of England Association at Leeds, 1883, p. 226. [This enters exhaustively into the chemistry of ammonia and its compounds.]

"Results Obtained in the Manufacture of Sulphate of Ammonia and Sulphuric Acid," by Mr. J. Hepworth, 1883, p. 235. [This paper was read at the same meeting as the preceding one, and both are quoted in the work of Dr. Lunge on "Coal Tar and Ammonia," pp. 567, 596.]

"On the Manufacture of Sulphuric Acid in Connection with Gas-Works," by Mr. J. Hepworth, 1885, p. 70. [Read before the same Association at Newcastle-on-Tyne.]

"On Something about Sulphate of Ammonia," by Mr. C. D. M'Allum, 1885, p. 73. [At the same meeting as the above.]

"On the Present Depression and Future Prospects of Sulphate of Ammonia," by Mr. Bradbury, 1885, p. 197. [Read before the Manchester District Institution of Gas Engineers at Liverpool.]

Discussion.

Mr. W. HARDIE, jun. (North Shields) said the paper would be very valuable as a complete historical record; but, so far as he had gathered, the only novelty mentioned was the carrying of the salt from the saturator on to the drainer by some system of steam ejection. He did not quite understand how it was done; and he should like to know if the salt was in the solid or the liquid form.

Mr. MILES asked if Mr. Veevers had seen the apparatus in operation, and if so, whether or not there was any difficulty in its manipulation. He said he had not heard any mentioned; but it occured to him that if the solid salts were carried by the ejector, there would be a tendency to choke the apparatus. He should also like to know if the system could be applied to an ordinary saturator, and what was the monetary saving by the Wilton apparatus.

Mr. J. T. SHEARD (Salford) inquired if the constitution of the salt was in any way affected by this process. There seemed to be no doubt, as to its practicability, because the results at Beckton had been given; but it occured to him that possibly the salt might contain more acid, and also more water of hydration. Ordinary sulphate of ammonia seriously affected the bags in which it was placed, and very soon rotted them; and he thought this might be even worse. Had any analysis been made of it?

Mr. J. BOOTH (Southport) said he had been a manufacturer of sulphate of ammonia for eight or nine years. He commenced on the intermittent system; and then, as the make of liquor increased, adopted the continuous process. At the end of last year he found he should have to enlarge his sulphate plant, and make continuously. He determined to adopt the best possible system; and the plan described in the paper was brought to his notice by Mr. Veevers. He at once saw that it would save a great deal of labour; and a month ago, in company with two of his Committee, he had visited the Beckton works, and witnessed the process in operation. He was surprised at the ease with which the solid salt was elevated from the saturator, and conveyed on to the draining-table; and he failed to see any danger such as Mr. Sheard had alluded to. As far as he could learn, the sulphate was all that could be desired. His Committee had decided to adopt the process; and he hoped soon to have it in use.

Mr. C. H. HUTCHINSON (Barnsley) asked if the process made any difference in the amount of ammonia in the finished salt. Was that made at Beckton still guaranteed to be 25 per cent., and had it to remain in store any longer than usual before it was fit for market?

Mr. MILES inquired to what cause the increase of about 20 per cent. in the result was attributable.

Mr. VEEVERS, in reply, said the salt as raised by the ejector was semi-liquid, but rather more solid than liquid. The water drained quickly away to the saturator; leaving the salt fit for removal to the store. Having seen the apparatus at work on a very large scale, he thought it well, before writing his paper, to try it on a small one; and he had worked it very satisfactorily for a week. He found that, instead of employing two men, he could do the work easily with one. Mr. Wilton said he saved three men out of four. He had not found any choking in the ejector. At Beckton there were four saturators leading into one tank, from which the salt was lifted out; and the work went on continuously night and day. In his own small works, having but one saturator, it was only put in operation when the salt was formed. As soon as the salt began to appear, they commenced to lift it out; and the water drained back again into the saturator. He had sent two samples to analytical chemists, and was surprised to find that there was slightly more ammonia in this salt than in that raised by hand. The authority for the statement that there was a saving of 20 per cent. was Mr. Wilton's letter. It arose through economy of labour.

The PRESIDENT said there was one important point in the paper which the Council had already taken into consideration—viz., the formation of a library of reference at the new offices in Victoria Street. He had already been looking through his own library, and should be happy to place in the hands of the Secretary his first contribution towards the library. He merely mentioned this in the hope that other gentlemen would be induced to do the same.

Mr. JOHN WEST (Manchester) next read a paper "On Recent Improvements in Stoking Machinery," at the conclusion of which the meeting adjourned for a short time. On the resumption of the proceedings, it was decided to defer the discussion to the next morning; and the business for the day closed with the reading by Mr. R. MITCHELL (Edinburgh) of a paper on "Eight-Hour *v.* Twelve-Hour Shifts." These and the other papers read (a list of which will be found below) will be given, with the discussions thereon, and the necessary illustrations, in subsequent issues of the JOURNAL.

On Thursday, the first business was the discussion of Mr. West's communication, at the close of which the rest of the papers were disposed of, in the following order: "The Extension of Gas Companies' Responsibility to Fittings beyond the Meter." By T. TRAVERS, of Cork. "Self Charging and Discharging Inclined Retorts." By Messrs. COZE and VAN VESTRAUT, of London. "The Principles Involved in the Construction of the Northwich Gasholder." By W. GADD, of Manchester. "On Wire Rope in Place of Rigid Framing for Gasholders." By E. LLOYD PEASE, of Darlington. The following papers were upon the programme; but, owing to want of time, they could not be read: "Experiments in Oxygenated Oil Gas (Tatham's Process) as an Illuminant." By L. T. THORNE, Ph.D., F.I.C., of London. "Illuminating Water Gas." By R. S. Moss, of Accrington. "Shall Gas Undertakings Supply Electricity? Yes." By A. F. GUY, A.M.I.E.E., of London.

VOTES OF THANKS.

On Thursday afternoon, the reading of the papers was interrupted for a time by the entrance into the hall of the Mayor and Town Clerk, who, at the invitation of the President, took seats on the platform.

Mr. J. M'GILCHRIST (Dumbarton) then proposed a hearty vote of thanks to the Mayor and Corporation of Ryde, the Town Clerk, and the Borough Engineer, and through them the inhabitants of Ryde, for the excellent arrangements which had been made for the comfort of the members of the Institute, and for the very cordial and hospitable welcome which had been accorded to them.

Mr. J. LOWE (Weymouth), in seconding the motion, said that, in his 24 years' experience of the meetings of the Institute, he never remembered its being accorded so handsome a reception.

The motion was carried by acclamation.

The MAYOR and TOWN CLERK each acknowledged, in suitable terms, the compliment paid to them.

Mr. A. MEAD (Chelmsford) then proposed a hearty vote of thanks to the authors of papers, including those whose contributions for want of time, had to be taken as read.

The motion was carried unanimously.

Mr. P. SIMPSON (Rugby) having referred to the great services rendered to the Institute by the President, in coming forward and accepting office at a time when they were in difficulties, moved—"That, in recognition of the services of the President, George Garnett, Esq., a suitable memorial, in the form of an address, be presented to him, for his valuable services during the past two years."

Mr. MILLS seconded the motion, which was carried by acclamation.

Mr. W. A. VALON (Ramsgate) said the Council, being fully aware of the feelings of the members on this matter, had taken steps to carry out what they knew would be the general desire, and had prepared an illuminated address to the President, which, in the unavoidable absence of the senior Vice-President, it was his pleasing duty to read and present. The address, which was handsomely illuminated in an album, was in these terms—

Dear Sir,—We, the members of The Gas Institute, in annual general meeting assembled, at the Town Hall, Ryde, Isle of Wight, June 17th to 20th, 1890, desire to express to you, on the termination of your presidentship, our grateful thanks for the important and valuable services you have rendered to the Institute as member of the Council and as President. You were elected a member of the Council in 1886; and on the resignation, in December, 1888, of the then President, you kindly consented to act temporarily in his stead; and at the annual meeting last year, you were, in token of the great appreciation of your services, unanimously elected by the members to the office you have since so worthily filled. The duties which have devolved upon you during your tenures of office have been exceedingly onerous; but you have never shrunk for any sacrifice of time or personal convenience in their performance. During the time you have held office, the Institute has derived great benefit from your sound judgment and ripe experience; and your addresses from the chair at the annual meetings of 1889 and 1890 will constitute a lasting memento of the services you have rendered. We therefore take this opportunity of expressing our grateful appreciation of the unremitting energy, attention, and thoughtfulness you have displayed in fulfilling the duties of your office. It is our most sincere wish that you may be spared for many years to continue your services to The Gas Institute, to the works over which you have control, and to the community in which you live, in well-merited honour and respect, and also that you may long continue to receive the esteem and good wishes of those who have the pleasure of your acquaintance.

The address was signed by the Vice-Presidents and the members of the Council.

Mr. HARRISON VEEVERS also presented to the President, on behalf of the members of the Council holding office at the date of last year's meeting, a large framed photograph, having the President's portrait in the centre, surrounded by those of the other members of the then Council.

The PRESIDENT, in acknowledging, in a very heartfelt manner, the unexpected kindness of his colleagues and the members of the Institute, said the picture was to his mind peculiarly valuable; and he would take care that, when he had done with it, it should come into the possession of the Institute.

PLACE OF NEXT MEETING.

Mr. D. CLARKE (Ashton-under-Lyne) moved that the next annual meeting be held in Carlisle. He said they had had two successive meetings in London; and if they went to Carlisle next year, they would have two successive meetings in the country. After this they would, if thought desirable, revert to the ordinary practice.

Mr. HARRISON VEEVERS seconded the motion.

Mr. LEES, as a native of Carlisle, supported the proposition, and it was carried unanimously.

MEMBERS IN ARREAR.

The list of members in arrear with their subscriptions was then read, in accordance with the rules.

PRESENTATION TO THE HONORARY SECRETARY.

The PRESIDENT next moved that a sum of 50 guineas be handed to Mr. Longworth, for the purchase of a gold watch and chain, in acknowledgment of his valuable services as Honorary Secretary, especially during the nine months of the past year before the Secretary was appointed.

Mr. S. W. DURKIN (Southampton) seconded the motion, which was carried unanimously.

Mr. LONGWORTH thanked the Council and members, and said he should always be glad to do anything in his power for the welfare of the Institute.

On the motion of Mr. CLARKE, seconded by Mr. ANNAN, Mr. Longworth was re-elected Honorary Secretary.

THANKS TO THE LOCAL COMMITTEE, ETC.

Mr. DUXBURY then proposed a vote of thanks to the Local Committee, the Isle of Wight Railway Companies, the Pier Company, and the authorities of the various local gas-works, for the manner in which the arrangements had been carried out, and for the facilities given to members.

Mr. R. HUNTER (Chester) seconded the motion, and it was carried unanimously.

The PRESIDENT acknowledged the vote.

NEW MEMBERS, ETC.

The following list of new members elected at the meeting was then read by the Secretary, and the proceedings concluded:—

Member.—William Barratt, Grantham.

Associate-Members.—John Holliday, Carlisle; Ernest James Sutcliffe, Burnley; Walter Arthur Valon, Ramsgate.

Associate.—Charles Bamford Williamson, West Hartlepool.

Transfers from Associate-Members to Members.—Francis James Baynes, Ystrad Gas and Water Company; Thomas Berridge, Litchurch, Derby; Frederick George Dexter, Winchester (late of Wantage); Robert Sharpe, Belfast.

Transfer form Associate to Member.—William G. Hicks, Ascot.

Transfer from Associate to Associate-Member.—Edgar Dean Martin, Ormskirk.

Steam-Boiler Management.—Mr. George H. Babcock lately read a paper at the Kansas City Electric Light Convention on the economical generation of steam; and as the composition of one of the most widely-known boiler makers of his time, and one of the pioneers of the water-tube boiler, the paper has been attentively read. Mr. Babcock admitted that various forms of boilers are called for by different applications, although within certain broad limits he declared that a method of steam-raising which is economical for one purpose will be found equally advantageous for another. With regard to the fuel used for boilers, Mr. Babcock remarked that local circumstances often determine the choice of the engineer. For some purposes it is very desirable that a boiler should be capable of being forced for a short time to meet an exceptional demand. After all, Mr. Babcock asserted that the chief essential in getting good results out of steam plant is brains in the manager and stoker, without which the best and cheapest fuel, the most perfect furnace, and the most exceptional boiler will go for naught.

Lighting by Induction.—Professor J. A. Fleming has read a paper before the Society of Arts upon Elihu Thompson's electro-magnetic induction experimens, which strikingly illustrate some of the phenomena of that most mysterious of electrical manifestations—the mutual induction of circuits. When the only electrical currents employed for practical purposes were feeble ones, the phenomena of induction possessed only philosophic interest; but now that currents strong enough to kill any animal, or set fire to a house, are sent for lighting purposes through closed circuits, it becomes more generally interesting to know what influence these powerful currents are capable of exerting upon neighbouring and disconnected wires or closed metallic circuits. After exhibiting a variety of striking experiments illustrating the effects of the self-induction of circuits, electro-dynamic repulsions produced by an alternating electro-magnet, &c., Professor Fleming showed a particularly beautiful experiment displaying a light as produced by force at a distance. An ordinary incandescent electric lamp is attached at its terminals to a small coil of wire, and the whole floated freely in a vessel of water; where, of course, its position would depend upon the relative effects of the buoyancy of the exhausted bulb and the weight of the wire. As arranged for the experiment, the lamp and coil looked like a submerged balloon and car. There was no connection whatever between the lamp and coil and anything outside the jar of water; and accordingly they might be described as floating in space. If now the vessel of water and its contents are placed in the magnetic field over a vertically-disposed coil in which an alternating current is excited, the lamp is illuminated by the induced current, and the repulsive electro-dynamic action shows itself by lifting the lamp and coil upwards through the water. It is only necessary to interpose a plate of copper between the vessel and the magnetic pole to screen off the inductive action, when the lamp is extinguished and falls to the bottom. At the same time the copper plate emits a sound described by Mr. W. H. Preece as a roar, the like of which he said might be produced in every telephone in London when the Deptford electric light station commenced work with the expected strong currents.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1200.)

THE general tendency of the Stock Markets during the past week has been the same as in its predecessor—viz., downward; and the causes also were the same, with the additional factor of a fine Ascot week, which drew many away from Capel Court. The supply of money was decidedly short; and a rise in the Bank rate on Thursday would not have come as a total surprise. Realizations continue, and new business is scarce; so departments all round are dull. The Gas Market, however, was not similarly affected; and a very fair share of business was done in it. The tone, too, was good, and several issues have made moderate upward movements; while not one nas suffered any abatement. Gaslight "A" opened well, and then improved; and it has been steadily dealt in all the week at figures showing little fluctuations, though on Saturday the range of price ran from 248 to 250½. A few transactions in the second issues have been marked at better than average figures. The prospective reduction in the dividend owing to the rise in the price of gas, as it will not take actual effect until next March, appears to be too remote to affect the market. Another week, however, will see the end of the current half year; and the revelation of the Metropolitan Companies' working and earnings for that period will be eagerly looked for. The only dealings in South Metropolitans were a few in "B," at good prices. The quotation remains unchanged; but "C" is 2 up. Commercials are inquired for; but no business has been marked. The new stock is quoted 1½ higher. Suburbans and Provincials are firm, but inactive. The West Ham Company disposed at the Mart of £12,500 in new 7 per cent. shares of £10 each; and they realized curiously divergent prices, from 13¾ to 15⅛. This Company are certainly singular in their policy, for they have reduced the price of gas by 3d. per 1000 cubic feet. The Company have just come under the sliding scale, and seem very eager to use it. Several Foreign undertakings have been brisk. Imperial Continental led the way, and shows an advance of 1. Continental Union preference was in demand, and rose 1. Bombay and Monte Video also were firm and active. Water has shown a little more activity, and is generally firm; though East London has lost a point.

The daily operations were: Moderate business in gas on Monday; but a good firm tone all round. Gaslight "A" rose 1. In Water, East London was weak, and fell 1; but West Middlesex improved 2. Gas remained the same on Tuesday, with no variation except a rise of 1 in Alliance and Dublin 7 per cent. Water was quite stagnant. Wednesday's Gas business was largely in Imperial Continental, which advanced 1. Other improvements were 1 in Continental Union preference, and ½ each in San Paulo and Pará. There were a few dealings in Grand Junction Water. Gas was quieter on Thursday, and without special feature South Metropolitan "C" advanced 2; and Commercial New, 1½. Dealings in Water included some in New River at moderate prices. Southwark ordinary rose 1. Gas continued firm, and was moderately active on Friday, without any change; and the Water Companies generally were the same. Saturday was brisker than usual, especially for Gaslight "A." Quotations closed unchanged. Nothing was done in Water; but Southwark ordinary rose 1 more.

GAS COMPANIES AND THE FIXING OF GAS APPARATUS

THE fatal accidents due to the use of gas-heated "geysers" in small unventilated bath-rooms, to which attention has lately been directed in these columns, suggest several considerations that are important to the suppliers of gas. The report that a gas company was in a certain measure responsible for one of the accidents—to the extent of having fixed the apparatus in question—has been authoritatively contradicted; but it is easy to conceive, without any very great stretch of imagination, that a gas company might have fixed it. Many companies now make a practice of keeping a show-room, where a large selection of gas appliances of all kinds is on view. Suppose that a customer calls at the show-room, and either sees a sample of a particular apparatus, or perhaps, failing to find just the thing he fancies, selects it from a catalogue. If he desired a certain kind of appliance, so long as it was made by a reputable firm, there are few who would refuse to get it for him on the ground that it had not been officially tested on their own premises and by their own officials, or that they were not in a position to guarantee, from their own knowledge, that it would operate safely and efficiently in practice. The tendency is rather the other way. In the natural desire to place out as many appliances as possible—not solely on account of the profit earned by the sale, but because each apparatus sent among the consumers is an additional agent for using the gas supplied by the company—it is more likely that the whims and fancies of the buyer will be pampered by getting him anything he chooses to call for. In a similar manner, the apparatus is fixed in any hole or corner to suit the wishes or the convenience of the customer. Few houses have any proper provision for the accommodation of gas-stoves or similar articles, so the majority are put up in what is really only a make-shift kind of way, and in many cases without any care as to the proper air supply or the removal of the products of combustion. It is quite possible that, under present arrangements, an apparatus such as a "geyser" might be selected by a customer, ordered by a clerk, and fixed by one of the company's fitters in such a position as to be really dangerous.

Gas engineers, as a body, are by no means disinclined to make capital out of the fatal accidents which have occurred in connection with electric lighting, and through the use of oil-lamps. In a similar manner, it is only to be supposed that those who are interested in the supply of electricity or petroleum, are not disposed to minimize the dangers attendant upon the use of gas. Under these circumstances, it is important that the causes of the fatalities that have taken place in connection with the domestic application of coal gas should receive careful attention. They are not to be explained away on the ground of public ignorance of every-day science, &c., or by a reference to the number of years that gas has now been before the public. The electricians, and any other "icians" could do as much, if they were granted a similar degree of license; and every gas engineer knows that, notwithstanding its general use, the great majority of the public are lamentably ignorant as regards the principles concerned in the economical combustion of gas, &c. People "ought" to know that by touching an electric wire they may connect themselves up into a circuit as surely as they may do so by joining hands in the circle that is formed for the experience of an electric shock at the close of a lecture on electricity. They "ought" also to know that a large gas-burner cannot be used with impunity in a small or unventilated apartment. All this, unfortunately, does not alter facts; and we are left to lament the occasional fatal results of carelessness or ignorance, even among well-informed people.

It has become quite the fashion with gas engineers, directors of gas companies, and others interested therein, to lay at the door of the gas-fitter many of the evils endured by the consumer of gas. As with other fashions, many of those who have followed this particular one would find it difficult, if driven into a corner by the searching examination of a clever barrister, to give chapter and verse for such an opinion. Yet we often hear it said, when a gentleman complains of his gas-burners or his gas-stove, that the remedy is to be found at the gas office. "Consult the manager of the company, and all will be well," it is said. So far, we quite agree that the gas company should take up the position of advising on the best methods of using gas for any purpose. They are so situated as to be, in many ways, best able to do so. But having undertaken this responsibility, they should be prepared to meet it—not in an off-hand, perfunctory sort of way, but thoroughly and vigorously. Many who talk about going to the gas office for advice have failed to appreciate the extent of this responsibility. Some idea of what that is, may be gathered from the circumstances surrounding the melancholy accidents that form the text of this article. There are few gas managers who are in a position to have thrown in, as a sort of make-weight with their other duties, the onus of advising anyone who may call at their office as to the best means of using gas for any of the multifarious purposes to which it is now applied. Perhaps it was possible for them to do so when the gas appliances in general use were confined to a few simple types of apparatus—such as the ring boiling-stove, the cooker with its rings of jets inside and boiling burners on the top, and the heating-stove consisting of a sheet-iron cylinder containing a few gas-jets; and also when the number of gas consumers in a town was numerically very much smaller than it is now. In a gas undertaking of any magnitude, it is simply impossible that the manager can take personal cognizance of the details connected with every order for gas apparatus. There are many works in a sort of "hobbledehoy" position—not large enough to furnish full employment for a competent manager of the gas apparatus and fitting department, and yet doing a sufficient business in this line to render it impossible for the manager, having regard to his other daily duties, to exercise more than a general or cursory supervision. The details of the department are in the hands of clerks and fitters. We do not lose sight of the fact that many of our larger companies carry on a certain amount of testing and examination of gas burners and apparatus. The particular makes of cooking and heating apparatus that are let on hire by the company, for example, come in for a good deal of attention; and in time both the manager and his subordinates become fairly well acquainted with the behaviour of those particular varieties. But this is a very different thing from having an intimate acquaintance with all the numerous varieties of gas apparatus that are now put before the public.

Admitting that some proportion of the business done by gas companies is carried out in the manner above indicated, it is necessary to pause and inquire, "Where does the advantage come in, which the consumer has been led to expect? In what way is the consumer benefited by going to the gas company's office rather than to the shop of any ironmonger or plumber who calls himself a gas-fitter?" The tradesman most probably numbers among his staff a workman of some experience in putting up gas-fittings and pipes. The procedure in each case is the same. The apparatus is ordered from the maker; and the workman is sent to fix it. The chances

are that the man employed by the tradesman will be as competent in every way as the one employed by the company. For every fatal accident that occurs, there will be a number of others that, fortunately, are not so serious to the consumer, but are yet of almost equal importance, from a business point of view, to the suppliers of gas. A fatal accident attracts special attention among people in the vicinity—in the same street or neighbourhood. Nervous persons will rush to the conclusion that gas is possessed of terribly poisonous properties, and will purchase safety by greatly curtailing its use, if not by dispensing with it altogether. Some who at present employ geysers and apparatus on a similar principle, will summarily reject them rather than face an unknown degree of risk. Apart from the effect of the accident itself, however, on the consumption of gas, there is also the probability that, in a number of cases, gas is tried for such purposes, and that the want of ventilation is discovered before fatal or even serious consequences follow. Under such circumstances, of course, the use of gas is dispensed with for this particular purpose. It is quite possible that the gas company who supply apparatus to order may assist quite as much in this direction as the much-abused gas-fitter.

If the staff of the Company are sufficiently numerous and competent to deal properly with the responsibility involved in the general invitation to come to the gas office for advice, then such a thing as the fixing of a geyser in such a locality that its use would endanger health and life, by reason of the need of efficient ventilation, should not pass unnoticed by the responsible agent of the company under whose auspices the apparatus was supplied and fitted. If the workman who actually put in the apparatus was not sufficiently well acquainted with the science of combustion and ventilation to be able to determine this point, then arrangements should be made for the inspection and laying out of the job, before it was actually carried out, by some person authorized and competent to pass it as safe or to condemn it as being otherwise. In the absence of proper surroundings, it would be much better to refuse to fix the apparatus in the first place, notwithstanding the loss of business thus involved, than to take the risk, and bear the blame and trouble due to its imperfect operation, or to accidents caused by it. The manager himself may undertake such inspection in very small country works; but he could not do so in those of greater magnitude. In larger towns, the head of the gas-fitting department could not, single handed, undertake to make a systematic and proper investigation in connection with the fixing of each piece of new apparatus. Some addition to the staff of employees generally to be found in gas-works would be needed. It is scarcely possible to lay down any definite rule as to what that addition should be, as it must in each case be determined by local circumstances. Each manager of gas-works, if allowed sufficient authority by his directors, would be able to make satisfactory arrangements for meeting the need.

Gas companies have not only the loss of business, but that of credit and reputation to consider. However the case may stand as regards gas-fitters and makers of apparatus, the consumer has a right to expect that advice received at the gas office, or in an official manner from a recognized agent of the gas company, should be beyond reproach. Unless the advice given is such as should be proved by every-day experience to be really reliable and sound, the position of the gas company will not be materially improved, and they had better have left matters as they were.

There is not only the question of new apparatus, but also that of complaints. A careful examination into the cause of every complaint, conducted by a competent authority, would do much in the way of smoothing down the friction that arises between gas companies and some of their customers, and in getting rid of some of the existing prejudices against the use of gas. These are usually alluded to in a very perfunctory manner by the tradesman's workman, and not always in a better way by the man from the gas-works. The gas-fitter is sent to see what is the matter, and he knows that he is not expected to lose much time over the job. If a leakage is the source of complaint, he hurriedly smells about, or traces the pipes round with a match. Very soon there is found some defect that calls for a twist with the pincers or a smear of red lead; and the fitter then comes away with a sense of having done his duty, regardless of the fact that a second or even a third defect may exist, either one worse than the first. If a stove or other gas appliance is at fault, it is bungled with in a similar manner, very often without touching at all upon the real cause of complaint. Especially is this the case if an atmospheric gas-burner is concerned. The average gas-fitter believes that he can make any burner of this class go properly, by tinkering with the gas-way; and so he proceeds boldly to hammer up or to bore out the nipple, according to the pressure on at the time of his visit—in any case putting the burner out of gear, and rendering it more troublesome than ever in future. It would be interesting to know, if it could be determined, how many gas appliances are rejected in the course of a year from causes that would be remedied by following the suggestion above made. It would turn out that one stove had been sent back because it had been fixed in an unsuitable or badly-ventilated position; and that a cooking-stove had been returned because of variations in the pressure due to irregularities of consumption in the neighbourhood, which resulted in an excessive supply while certain other burners or apparatus were not in use. Such variations are sufficient to condemn any make of stove; and a good pressure-regulator would cure them. These remarks about pressure will also apply to gas-burners of the regenerator type, if fixed without governors. These are only examples of many little defects that would be unearthed by a systematic inspection, the want of which causes the consumer to grumble about the fitter always being in the house, that there is constantly a smell of gas or of imperfectly consumed products of combustion about the place, and so on, all of which tends in many indirect ways to the discouragement and hindrance of the extended use of gas.

In pointing out the responsibility of gas companies, it should be mentioned that this in no way attaches to that of the makers of apparatus, and the suggestions already advanced in these columns with regard to them. It is scarcely to be expected, even if every gas company laid themselves out to give advice when asked, that the whole, or even the bulk, of the new apparatus fixed in their district, should come to their knowledge; and, of course, they could not be held responsible except for those matters that come officially before them. Any action taken by gas companies would in no sense affect the desirability for issuing, with all apparatus that could by any possibility be fixed in such a position as to be dangerous, a set of rules for use, or warnings, legibly stamped upon some prominent part thereof. As regards the testing of new apparatus, there is no reason why each and every gas company should be called upon to provide the means of trying all apparatus that passes through their works. Mr. D. Kinnear Clark conducted a large number of tests for The Gas Institute in connection with the Crystal Palace Exhibition. Why should there not be a standing central testing-station, under the control of experts elected by the gas companies who supported it, where gas apparatus of all kinds should receive a searching and impartial examination on similar lines? Makers of really reliable appliances would be glad to have them properly tested and reported upon, and to guarantee that every sample sent out should be found equal, in practical use, to the one selected for testing. The results of such tests could be circulated among the subscribers, who would thus be put in touch with the results obtainable by the proper use of the most approved apparatus, as well as with the necessary precautions for securing a proper air supply by the removal of the products of combustion.

THE CARBONIC OXIDE IN WATER GAS.

At the last Meeting of the British Association, a highly instructive paper on the subject of "Water Gas in the United States" was presented to the Mechanical Science Section by Mr. Alex. C. Humphreys, of the United Gas Improvement Company, of Philadelphia.* This Company are the largest manufacturers and owners of gas plant in the States; and in his position of Engineer-in-Chief, Mr. Humphreys has devoted a very great deal of attention to the production of water gas. Knowing that his views on the important question of the presence of carbonic oxide in this gas would be of special interest to our readers, we have taken advantage of a visit he has paid to this country during the past few weeks, to ascertain them. We cannot do better than reproduce Mr. Humphreys' own words.

As an operator of a large number of works in America where both coal gas and water gas are made, I have grown (says Mr. Humphreys) to disregard the question of carbonic oxide poisoning entirely. In other words, letting it be borne in mind that water gas is very much lighter than air—being only a little heavier than coal gas—and that it is also, as distributed for general consumption, carburetted by oil, so that it has a most pungent odour (fully equal to that of the ordinary coal gas), there is practically no more danger from it than there is from the distribution of any other illuminating gas. The points as to carburetting the gas, the consequent definite odour of the gas, and the fact that the gas is lighter than air, I would particularly refer to, because in the carbonic oxide contests in America, so-called "blunders" have been made respecting these matters. It has been widely stated that it is proposed to furnish water gas without odour; that it would be heavier than air; and, therefore, that it could escape into bedrooms, and gradually rise until it reached the sleeping occupants—death, of course, ensuing from lack of ventilation. I fancy it is very probable that these statements, although originally made in ignorance, were kept in existence by those who knew they were erroneous. In America, water gas is not distributed unless it is odorized; and I would not for a moment think of taking the responsibility of sending out a non-odorized water gas, any more than I would take the responsibility of distributing coal gas if it had no odour.

This subject of water-gas poisoning has been most completely investigated before the Massachusetts Legislature—first in connection with the passage of what is known as the Ten per Cent Carbonic Oxide Law; and later in connection with the repeal of that law, which was effected a month or two since. Many of the gas engineers who originally agitated to get the law passed,

* See JOURNAL, Vol. LIV., p. 644.

joined in the effort to have it repealed; having in the meantime become better informed on the subject. At the same time the hearing was being held on the question of the repeal of the Massachusetts law, an effort was being made to have a similar measure passed by the Rhode Island Legislature. After a very thorough hearing before a Committee, it failed of passage. The proceedings in connection with the Massachusetts carbonic oxide law have been published in full, and can be obtained, I have no doubt, through the Boston Gas Company. One document that was published is extremely instructive, as it reminds us of the fact that, when it was first proposed to introduce coal gas, the same fears were entertained in regard to its effect upon human life. This document is a reprint of a petition, circulated about 50 years ago, and signed by prominent citizens of Philadelphia, protesting against the introduction of illuminating (coal) gas for the very reasons that are now urged against water gas; and these people had practically as much reason for their objections as the opponents of water gas in the present day have for theirs. No illuminating gas is made and distributed for inhalation, but it is made and distributed for burning for light-giving purposes; and if it has a strong odour, there is no more occasion for accident consequent upon its use than in the case of many of the other innovations of the present century. Coal gas, if inhaled in sufficient quantities, will produce death just as surely as water gas. If any limitation is to be placed upon the composition of gas with regard to carbonic oxide, then the idea of furnishing water gas in the United Kingdom may as well be abandoned; for it is nearly the most valuable diluent at our service, and its percentage can practically only be lessened by reducing the carbonic oxide to carbonic acid, and then, by a later process, removing it—say, by lime purification. This all means that, commercially, it cannot have a place in competition with coal gas, or water gas, as now made. In other words, any scheme which has for its ultimate object the removal of the carbonic oxide from water gas can be successfully criticized at once on the ground that we should be paying for the removal of a very valuable part of the bulk of our gas, while, instead of having to so pay for its removal, we ought to be able to sell it to the consumer—to his advantage and satisfaction, and our profit. Even could the carbonic oxide be taken out for nothing, we should still be *giving* away something that we could otherwise *sell* for a price. A water gas which did not contain carbonic oxide would not have the same strong qualifications as a high-candle power gas diluent. Of course, where water gas is made to mix with coal gas to give increased candle power and for other good reasons, the percentage of carbonic oxide in the mixed gas can be maintained at a figure sufficiently low to reassure the timid ones; the percentage being nearly in proportion to the amount of water gas carried into the mixture. This would give some of the advantages of water gas, though not to such an extent as if there were no limit as to carbonic oxide.

The Association of Municipal and Sanitary Engineers and Surveyors will hold their annual meeting in Liverpool, on Thursday, Friday, and Saturday next. After the adoption of the annual report, the presentation of premiums, and the transaction of the general business, the President (Mr. H. P. Boulnois, City Engineer of Liverpool) will deliver his Inaugural Address. Among the papers to be read will be one on "The London Sewage Question," by Mr. Crawford Barlow, B.A., M. Inst. C.E.; and the outdoor portion of the proceedings will comprise visits to the Mersey Tunnel, the electric lighting station, and to the pumping-station of the Liverpool Hydraulic Power Company.

Artificial Emeralds from Gas-Retort Refuse.—Owners of precious stones were surprised a short time since by the announcement that a method of producing artificial emeralds and other gems from the refuse of gas-retorts had been discovered by Mr. Greville Williams, F.R.S., the Chemist of The Gaslight and Coke Company. According to a daily contemporary, the gem which Mr. Williams has modelled is composed of about 67 to 68 per cent. of silica; 15 to 18 per cent. of alumina; 12 to 14 per cent. of glucina; and minute proportions of magnesia, carbon, and carbonate of lime. The intensely green colour for which the jewel is valued is believed to be due to a slight dash of sesquioxide of chromium, though this tint has by some chemists been attributed to vegetable matter—the analyst having to proceed warily when dealing with such costly stuffs as diamonds and emeralds. It may, therefore, be presumed that Mr. Williams has turned out his artificial emerald by a skilful fusing and crystallization of these ingredients. It seems, however, that there is nothing very new in the artificial production of precious stones—these having been made upwards of sixty years ago. In 1837, Gaudin produced rubies by heating ammonia, alum, and potash by means of the oxy-hydrogen blowpipe; the intense heat developed by this apparatus volatilizing the potash and the alumina, then crystallizing in rhombohedral forms identical with those of the natural stone, and having the same specific gravity and hardness. The artificial production of precious stones is interesting from the standpoint of the chemist and mineralogist, and in the present case the gas manufacturer may be included; but the cost entailed is too great to allow of the operation being a commercial success, and therefore the dealers in these adornments will probably not have to close their shops as the result of Mr. Williams's discovery.

TECHNICAL RECORD.

AN AMERICAN GAS ENGINEER'S IMPRESSIONS OF BRITISH GAS-WORKS.

At the Annual Meeting of the Western (U.S.A.) Gas Association, held in St. Louis, Mo., towards the close of the past month, Mr. G. T. Thompson, of the Laclede Gaslight Company of that city, read the following paper, setting forth his impressions of the various gas-works inspected by him during a visit to this country in the summer of last year.

To an American engineer, one of the first contrasts between the gas-works of Great Britain and those with which he is more familiar would, I think, be the ratio existing between the quantities of gas made in winter and in summer. Owing to the high latitude, this is usually, in British works, about as 5 : 1. The next point noted would probably be the relation of annual output to the population of the district supplied. This may be roughly placed at two or three times the ratio in England than is the case in America. A visit to nearly forty works throughout Great Britain during the summer of 1889 showed the case to be the same there as in America—that the largest works are not always the ones to show the most valuable or original ideas. The points that may be mentioned in a paper such as this, may best, for convenience, be arranged in the order of the manufacturing apparatus.

In general, as transportation is not interrupted for any considerable period through the year, large coal-stores are not necessary. Sufficient space for about four weeks' average supply is provided under the same roof as the retorts. Newcastle coal does not differ greatly from Pittsburg coal; and the Midland coals are somewhat similar to that which we get from Indiana, though perhaps yielding more tar and carrying less sulphur. About 10,000 cubic feet per ton of 2240 lbs. is the standard yield of 15½-candle gas, enriched to 16 candles or upward by small percentages of cannel. Except where, as in Scotland, cannel is the sole or principal gas-making material, the illuminating power of the gas seldom exceeds 17 candles.

The buildings of the works appear more solidly constructed than do ours—a characteristic of English structures in general. Mr. Newbigging's condemnation of the practice of permitting waste gases from the bench furnaces to enter the air beneath the retort-house roof has no application there, as chimneys are always provided. The latest constructed retort-houses are ventilated by square or circular openings at the apex of the roof, several in the length of the house, in place of louvres. At the Rochdale Road works, Manchester, and the Portslade works, Brighton, the chimneys pass through these ventilating shafts, which arrangement is said to be additionally effective in clearing the house of smoke.

In the two great London Companies—the Chartered and the South Metropolitan—two contrasting arrangements of retort-houses are to be seen. In the Beckton works of the former, the twelve houses are placed in two rows of six each, end to end; while at the Old Kent Road station of the second-named Company the several houses are side by side, with coal-stores between—saving to each house the cost of an entire side wall.

The retort-house windows are set above the level of the benches; and care is taken to prevent ill-effects to the heats by draughts—a matter which, though recognized as a partial necessity by American engineers, does not always affect their plans in construction. For works of medium or large size, the ground-floor house has more advocates in England than in America. In the stage-floor houses, the openings in front of the ranges are without doors or covers. The retort-settings are built with fire-bricks cut to fit, instead of having blocks and tiles to lessen the number of joints in the oven, and thus make work easier in building. Except in small works, the retorts used are "throughs;" and as these are credited with greater ease of scurfing, while the singles work better to the hydraulic and give less chance of trouble with workmen, Mr. J. Ferguson Bell, Gas Engineer to the Stafford Corporation, suggests that the "throughs" should be blocked in the middle, and worked as singles until requiring scurfing, at which time the block can be knocked out and the retort be scurfed as a "through."

There are some strong advocates of brick retorts, and the benches at the new East Greenwich station of the South Metropolitan Company are entirely set with these. Tiles with sides curved upwards are used for the bottoms, and the Ω built upon these with soap-brick, with continuous joints. At the Old Kent Road, the mouthpieces are attached to brick retorts by having the entire bench-front of cast iron lined with fire-brick; but at Greenwich the mouthpieces are bolted to a cast-iron shell, into which the end of the retort is built. I do not remember having seen a cylindrical retort in any American works; but in England they are frequently met with, while there (as here) ovals and Ω retorts are about equally in favour. Their "D's," however, have quite a sharp lower edge. The sizes of the retorts are about the same as are used in America; but the charges are rather heavier, and their duration usually six and in some places even eight hours.

The consumption of coke as fuel, except where a considerable proportion of cannel is carbonized, will not exceed an average of 30 per cent. of the make in direct firing; and it is, of course, still

less where regenerators are employed. This lower figure than our own is possible by the use of the longer charges and somewhat lower heats, and to some extent by the greater average number of retorts per setting. An estimation of the fuel on the carbonization is made in some places; the result being also stated in a percentage. On this basis, 18 per cent. of fuel would indicate that 18 lbs. of coke were consumed to carbonize 100 lbs. of coal. Some 6000 cubic feet of gas per day is accounted a fair yield per mouthpiece. In the Scotch works, mixtures of (say) two parts of cannel, and one part of splint coal are made, which, with three-hour charges yield about 11,000 cubic feet of 29-candle gas per ton. Even with regenerators, 45 per cent. of the coke from this would be used as fuel; but its quality must be remembered.

In general, the English gas stoker is better provided for at the works than his American brother. The retort-house almost invariably has a lobby (in which the workmen have lockers for their clothing), a wash-room, and a larger room with a range or an open fireplace for heating coffee, cooking eggs or steak, &c. In addition to these, there is often an assembly-room for concerts or other entertainments, and a reading-room; and of these the men are very proud. In large works, such as those at Beckton, Nine Elms, Stepney, Old Kent Road, and the principal provincial stations, the men have organizations of their own, varied in character, but all tending to good effects. At Leicester there is a thriving literary society and an efficient ambulance corps; at Beckton, a fire brigade; at Southall, a cricket team, having grounds placed at their disposal by the Company. These and many other works have brass bands. The employees of the Brentford Company have also a Mutual Aid Society, into which each man pays 6d. a week, drawing 15s. a week if sick or disabled, and with a fund for his family in case of death.

Sunday day labour is very generally avoided, though the men always hold themselves in readiness to work if required. But usually only enough men are kept to "lunch" the fires perhaps twice, the dampers being closed, and the spent charges not withdrawn. In case a retort requires scurfing, the coke is drawn; and in one operation with the through retorts, the carbon is loose and the stand-pipes cleared, without channel tiles.

The workmen are paid much less than they would receive in America; but the prices of staple articles range considerably below our standard—for rents and clothing in particular. The eight-hour system has been adopted in a number of works during the past year. Several forms of power stokers are to be seen—West's, Foulis's, and Ross's; but, owing to the cheapness of labour, their use is not attended by such a saving as is the case with us.

From the hydraulic main the gas is led to the condensers by a so-called "foul main," which very often entirely encircles the retort-house. The condensers are nearly all atmospheric, set in the open air; and the annular, battery, and return-tube are popular forms. I heard of but two cases of trouble with naphthalene. In one of these the steam-jet exhauster was the cause; and in the other the deposit was found at the holder inlet, where the connecting mains were carried down in the water, in a recess in the tank wall. So neither case was remarkable; and neither was difficult to handle. One engineer told me that he avoided naphthalene by keeping a uniform temperature of 67° Fahr. at the condenser outlet. But I think the lower heats carried in England, and the freedom from sudden atmospheric changes, are mainly responsible for the absence of this trouble.

The exhauster most in use is the Beale—very similar to our M'Kenzie. In many American works the gas is led to the exhauster before passing the condenser; but this practice is seldom seen in England. Moreover, in two of the works visited, the exhausters were placed between the scrubbers and the purifying boxes. Some use of compound engines, and even of the triple-expansion type, is made for driving exhausters.

The pressure-gauges used are very deep, compared with those employed by us; and 48-inch gauges are by no means uncommon. The lack of holder counterbalances and the comparative cheapness of iron, and its consequently more extensive use in holders, enter as factors to necessitate this; and the purifier lutes and other seals are, of course, correspondingly deep. The simplest gauge seen consists of a 1-inch glass tube closed at the bottom, with a loosely-fitting cap at the top, through which passes a ¼-inch tube, with the gas connection at its upper end and with the lower end notched. A scale behind or at the side completes the instrument. The jet photometer for detecting the production of gas of low illuminating power is usually placed by British engineers at the exhauster outlet, so that the poor gas may be more quickly noted. The photometer generally stands on a case in which are two cast-iron boxes, a foot square, with faced cast covers, controlled by two four-way valves, and filled with an oxide of iron tray each. The gas is thus sufficiently purified for the approximate test required.

The washers and scrubbers employed are almost as varied in pattern and method of use as the works themselves. But the accepted practice at this stage of the purification seems to be the treatment of the foul gas by a washer charged with ammoniacal liquor, designed to combine a portion of the sulphuretted hydrogen and carbonic acid impurities as sulphide and carbonate of ammonium, and to this extent to lighten the work of the dry purifiers. The last of the tar is also removed in this apparatus. Then follows a tower scrubber, into which clear water is admitted, to complete the extraction of ammonia. The yield of ammoniacal liquor, of course, varies with the works, and as large an amount as 35 gallons of 10-oz. liquor per ton is reached. The absence of extreme temperatures in English weather permits the purifiers to be set out-of-doors. But lest rain should interfere with the work of emptying or refilling empty boxes, sheds usually cover the sets; though sometimes a portable roof is provided, or the box-lid itself used. When either dimension of a box exceeds 20 feet, the cover is usually lightly trussed.

The very general parliamentary or local restrictions regarding the amount of impurity—particularly sulphur—in the gas as delivered, and to some extent affecting the opening of foul boxes, have resulted in numerous systems being advanced to simplify or cheapen the process, or to avoid the nuisance attending it. Valve systems have largely aided in this; and where centre-seals are in use, a catch-box is provided to prevent the output of foul gas, which might pass through the seal when a change is made. In the materials for purification, a large amount of oxide of iron and Irish bog ore is used—not always revivified *in situ* by any means. Indeed, I received the impression that in proportion to the number of works using oxide, there is more reviviing *in situ* in the United States than in England. But air is very considerably employed in lime purification, and was the forerunner of Mr. Valon's oxygen process. With lime, the effect of the air introduced seems practically the same as with oxide—sulphur is partly fixed in the material, and the frequency of purifier changes is much diminished, while the spent lime is largely deprived of its obnoxious smell. In most of the works, iron and lime are used in conjunction.

Like the purifiers, the station meters can be set out of doors, and in some cases the housed and the unprotected meters may both be seen in the same works, notably at Beckton. Generally, though, the meters are in buildings, as with us; but the form of the instrument, except in smaller sizes, is the square cased. The unprotected meters at the South Metropolitan's Old Kent Road and Greenwich stations are the invention of Mr. George Livesey. In these, the lower three-quarters of the case is of concrete, set into the ground, while the part above ground is cased in zinc and covered with tongued-and-grooved boarding, with a non-conducting packing between boards and metal. The drum is of the usual form; and the dials are protected in a padlocked case at one end. Many of the meters have for the water-line indicator a differential pressure-gauge, which also shows the levels of water within and without the drum. In some of the French meters, brass discs, bearing the ten numerals on their edges, are substituted for the usual dials. These edges face outwards; and the discs turn as do the registers on some of the American street-cars, exhibiting but one figure of each disc, so that the reading can be taken at a glance without error.

The most sweeping change in gasholder construction is that seen at the Rotherhithe station in London, in dispensing with upper guide-framing. The structure on which this has been tried was a double-lift holder of a million cubic feet capacity, working in an annular iron tank, standing about three-eighths above ground. On the addition of the third lift, the spar columns were each tied to the tank by two additional angle-irons; the channel-iron tank-curb was reinforced by curved plates placed horizontally, and riveted to the channel-irons and to an additional angle-iron within; and a cement filling was added between the back of the guide-rails and the inner face of the columns. The second and third lifts carry both radial and tangential rollers; but the topmost section has only radial rollers. The channel guides on the columns are carried about 2 feet above the caps and then curved outward and braced to the entablatures. The sections are each about 29 feet deep; and the tank stands about 12 feet out of the ground. So that the columns are 70 feet high, and the unsupported lift rises 25 feet above this. In this position, it withstood several storms in the winter of 1888-9. Near by another holder in a cast-iron tank, 80 feet in diameter, was also being rebuilt, to have five lifts each 23 feet in heigth (exclusive of cupping), and columns to the top of the third lift; thus leaving 46 feet in 115 feet clear of the framing.

It is no doubt the case that many holders are in use of which the framing, owing to having been built by "rule-of-thumb" or with more than ample margin for safety, is considerably in excess of the needs of the accompanying lifts; and in such cases this system might profitably be applied if the strength of the existing framing were known. But in new constructions it seems to be a question of supplying strength in heavier bottom curbs, cups, guides, and rollers, and more firmly-anchored framing, if absent in the upper structure. This problem, however, is receiving much attention; and between this solution and that offered by Mr. Gadd and others, the future of holder construction may show many changes.

The English holders in general do not carry any counterweights. Those above medium size are mostly fitted with both radial and tangential rollers; and in France there are a number of holders with tangentials only. While most of the structures erected lately show the use of channel-guides instead of channel-rollers, those less recently built have only single-flanged guide-wheels, set alternately right and left. The side sheeting is nearly always made with the vertical joint continuous as well as the horizontal. Piggott cups are extensively used. Dry wells for the inlet and outlet pipes are more common than with us, though they are not now built for tanks of large size; and in France the articulated pipes are much in favour.

Among the new points now introduced are two brought forward by Messrs. S. Cutler and Sons, which deserve special notice. The first is the placing of the web of the lattice cross-girders horizontally instead of vertically between the columns. The second is an improved arrangement of the crown plating. The plates are all cut and punched alike, two widths in length at the joints, all double riveted. The centre plate overlaps on all sides; and the others have a uniform fall downwards, and outwards, until near the curb a strong construction of concentric rings of steel sheeting meets the rectangular plates. This system by lessening the unbroken joints, dispenses with the necessity for heavy centre plating and graded concentric sheeting, except at the curb; thus simplifying and cheapening the construction as well as strengthening it.

At the works of the Crystal Palace District Gas Company, the ashes, breeze, broken retorts, &c., are being used with tar to form a new gasholder tank. The blocks are being made on the spot where they are to be used after the excavation is done. This tank wall is intended to brace the clay only, as the latter is of good quality and firm. Tank framing is superseding crown trussing, and there are in use several tank crown supports of iron.

The main-pipes about the works are generally made with the turned-and-bored joint; and this is also employed considerably for the street mains. The street pressures are about 6-10ths minimum and 25-10ths maximum; for in localities at all hilly, district governors are used. The leakage averages but little above 6 per cent. of the make. A large proportion of the consumers' meters are of the wet description.

With regard to residuals, the coke brings about 7d. per cwt. (or 4½c. per bushel of 36 lbs.) at the works in London; but in the provinces the price is lower. The enormous production of coke by gasmakers (no water gas being made) keeps the price down to even a greater relative extent than is done in America by the Pennsylvania ovens. The manufacture of sulphate of ammonia by gas companies and corporations is much more extensively carried on in England than here; and in some places the tar and sulphur are also worked up.

The price of gas averages about what is charged in the Metropolis—viz., 2s. 6d. per 1000 cubic feet; but in one place it is sold for 1s. 8d. These lower figures than ours are possible on account of the less cost of labour, coal, lime, &c.; the proportionately greater amount of gas sold, with its reduction of fixed charges; the higher return from the residuals; the lower candle power supplied; and the fact that the law does not permit, much less invite, competition, but rather protect the companies in a rigidly restricted monopoly.

In conclusion, I cannot speak too warmly of the hearty welcome accorded to me by every gas engineer whom I visited. Many of them entertained me at their homes; and I found everywhere a cordiality, a willingness to afford all desired information, and an interest in, and respect for American engineering, that produced an impression as lasting as it was agreeable.

THE KESWICK WATER POWER ELECTRIC LIGHT STATION.

In the JOURNAL for the 3rd inst. we noticed briefly the paper on the above subject prepared by Messrs. W. P. J. Fawcus and E. W. Cowan, Assoc. MM. Inst. C.E., which was read at the last meeting of the Institution of Civil Engineers for the past session. As then stated, this is believed to be the first attempt to utilize available water power in this country for the purpose of a public supply of electric light; and therefore the following additional particulars in regard to the installation may be of interest to some of our readers.

Early last year, the Directors of the Keswick Electric Light Company instructed the authors to prepare plans and procure tenders for the erection of a central electric supply station in or near Keswick. As the area proposed to be lighted was large and sparsely populated, it was seen that the only feasible system to adopt was an overhead high-tension one. The alternating current transformer system was finally selected; and a site on the River Greta, about three quarters of a mile from Keswick, was chosen for the erection of the station—the river being here available at a 20-feet head. The saving effected in using this water power is considerable. The rent paid for the water is 10s. per horse power per annum. Taking the number of horse-power hours required per annum as 100,000 for the present output of the station from a 50-horse power turbine, the cost per horse power comes out as 0·06d. On the other hand, taking the price of steam coal at 15s. per ton, and the quantity burnt per horse power per hour as 6 lbs., the cost per horse power comes to 0·48d., or eight times the cost of the water power. In addition to this, the attendance required for a turbine is, of course, less than that necessary for a steam-engine and boiler. The first cost, maintenance, and depreciation are also considerably less; and the chances of a breakdown much smaller. As there was a possibility of partial failure of the water during extreme drought in summer, it was decided to provide steam in addition to water power.

The turbine is of American design. It is of a "mixed-flow" type; the wheel being 20 inches in diameter. Its speed is 273 revolutions per minute, which is at least 70 per cent. greater than the speed of an inward, an outward, or a parallel-flow turbine would have been, working under a similar head. Its design is exceedingly compact; and the regulation, which is effected by opening and closing a cylindrical sluice working between the guide-passages and the wheel, is all that can be desired. As the turbine is 16 feet above the level of the tail-race, a draught-tube was necessary to give full effect to the head of 20 feet. This tube is of wrought iron, 14 feet long and 3 feet in diameter. The maximum velocity of water flowing through it is a little more than 4 feet per second. The engine is a Westinghouse of simple type, having two single-acting cylinders, 10 inches in diameter and 9-inch stroke. It gives, with 80 lbs. of steam, at 350 revolutions per minute, 50·11 brake horse power. The floor space taken up by the engine is 7 feet by 4 feet. The boiler is a 20 nominal horse power Hyde duplex, 4 ft. 6 in. in diameter and 11 ft. 6 in. high. Its working pressure is 120 lbs. to the square inch. The alternater is a 30-kilowatt separately-excited machine, giving an output of 15 ampères at 2000 volts. Its speed is 750 revolutions per minute. The armature has a cast-iron supporting ring, 28 inches in diameter and 2½ inches wide, provided with six arms. The armature core is of charcoal iron strip 2½ inches wide, wound with paper insulation to a depth of 8 inches. There are 19 coils, each containing 100 turns of 0·072-inch wire, covered to 0·092 inch in two layers. The resistance of the armature, after working some hours, is found to be 7 ohms. The magnetic field consists of 12 magnets on each side of the armature. The cores and pole-pieces are of wrought iron; the yoke rings, of cast iron. The former are cylindrical, 3¾ inches in diameter; the latter are 4 by 7¼ inches. Each core is wound with six layers of 58 turns per layer, with 0·102-inch wire covered to 0·117 inch; the total resistance, after working some hours, being 11·2 ohms. At full load the energy of the field is 3 per cent. of the output of the machine. The exciting dynamo is a 1-kilowatt machine of the Gramme type, giving 10 ampères at 100 volts. Regulation is effected by varying by hand the resistance in the field-magnet circuit.

Two circuits leave the station, both of which are double pole fused, and provided with double pole switches and lightning arresters. There are some special features in the method of carrying out the overhead mains. If wire of high insulation had been used, the expenditure would have been considerable, and it did not appear that any great advantage, other than increased durability of the mains, would have resulted. It was therefore determined to use a lower insulation for the mains, and to rely upon the points of support for insulation; also to use special arrangements for cutting off all surface leakage where the wires enter the consumers' premises. The authors are not aware that attention has been paid to this point before. The mains are being insulated from earth, and from each other, by oil throughout the system. The house leading-in wires are insulated with vulcanized india-rubber of the highest quality, and are threaded through a shackle oil insulator; the wire being cemented in with Chatterton's compound. Such an arrangement should effectually cut off surface leakage from the mains. The leading-in wires enter the roof through a stone-ware pipe, provided with a covering piece to keep out rain, and cover a reservoir of oil in the mouth of the pipe. The sizes of the mains are fixed for a current density of 500 ampères to the square inch. The fall of potential, between the generating station and the town, is only slightly above 1 per cent. at full load. The transformers are Kapp's patent and they transform the high-tension current of 2000 volts to 100 volts. A series of experiments has been made to test the machinery, with the result that the total efficiency of the generating plant at the station came out at about 40 per cent. at a quarter of the full load, and upwards of 70 per cent. at the full load.

In connection with the arrangement of this central station scheme, the authors had occasion to make a comparison between the illuminating power of glow lamps and gas. The results show that the relative values usually given are misleading, as they almost invariably deal with standard "London" Argand—a burner seldom used for ordinary lighting. This burner is generally taken as giving from 15 to 16 candle power for 5 cubic feet of gas consumed per hour; whereas out of a large number of ordinary burners taken haphazard, and tested where they are in use, in Chester, Manchester, and Keswick, at various times, it was found that the light given by 5 cubic feet of gas per hour is more frequently equal to 8 candles or less. This would show that, in practice, one 16-candle power glow lamp gives approximately the same degree of light as two ordinary burners, each consuming 5 cubic feet of gas per hour. This conclusion seems to be borne out by the result obtained by Dr. Hopkinson, who, experimenting upon some ordinary burners, found the average candle power to be 1·76 per cubic foot of gas. As regards glow lamps, Sir David Salomons found that 100-volt 16-candle power Edison-Swan lamps average 17-candle power at 100 volts.*

The authors state that the electric light has been received with great favour at Keswick, and that already the demand is equal to the supply of the present plant. Supply was commenced at the beginning of this year, and the station has run without a hitch up to the present time—a man and a boy being found sufficient for attending to the machinery.

* This part of the paper was commented upon in our "Electric Lighting Memoranda" a fortnight ago.—ED. J. G. L.

WATER-WORKS IN CHINA AND JAPAN.

At a recent meeting of the Institution of Civil Engineers, three papers describing water-works in China and Japan, were read. They dealt with the Shanghai, the Tytam (Hong Kong), and the Yokohama Water-Works; the authors being Mr. J. W. Hart, M. Inst. C.E., Mr. J. Orange, Assoc. M. Inst C.E., and Mr. J. H. T. Turner, Assoc. M. Inst. C.E. The following are the principal points of interest in the communications.

Shanghai, the chief commercial centre of North China, was the first city, either in China or in Japan, to be provided with water-works. It consists of foreign settlements and a native city; the population of the former—English, Amercan, and French—being 170,000 in 1885, and of the latter (by estimation) from 100,000 to 150,000. It is situated on the west side of the River Hwang-Poo; and the country is flat and of alluvial formation. The necessity for an efficient water service had been recognized for 20 years previous to 1880, when the author of the paper was invited to investigate the question again, and to prepare plans and estimates. The latter were accepted, and a concession was granted by the Municipality to carry out the works. To secure a constant supply of water, Mr. Hart constructed, in a central position, within the English settlement, a water-tower, to contain a reserve of 150,000 gallons at an elevation of 103½ feet above the main. To obtain a foundation on the unstable water-logged soil, he discarded the use of piles, and adopted a concrete foundation 5 feet thick, and founded upon 2½ feet of rough rubble; the area being 68½ feet by 65 feet, and the total weight to be supported 3725 tons, or 1847 lbs. per square foot—only a little more than 51·25 per cent. of the load applied in testing the ground. When the work was completed, it was found that the steady, accumulative weight of materials used (2735 tons) had caused an even settlement of 2¼ inches. The superstructure for supporting the tank is exclusively of iron, octagonal in form, 52½ feet in diameter. The tank is 50 feet in diameter by 12¼ feet deep, and contains 670 tons of water. The roof, covered with corrugated galvanized iron, closely resembles the construction of an umbrella when open. The centre tube is 6 feet in diameter and 82¼ feet long. One 20-inch pumping-main has been laid between the water-tower and the pumping-station three miles lower down the river; and provision has been made for a duplicate main. The mains are connected with the tower by a breeches-pipe communicating with the centre tube. The arrangements for the admission and egress of the water by valves were fully described. The water leaves the tower through meters, and is registered every day at noon; the quantity being compared with that which has been delivered from the pumping-station. In front of the tower, a 20-inch bye-pass main connects the inlet and outlet branches of the pumping and service mains, so that the water can be delivered direct through the settlements. When the tank had been filled with water, the total subsidence of the foundation was found to be 2½ inches. The total cost of the tower, exclusive of land, was £11,849. The Yang-Tsze-Poo works and pumping-station are on the banks of the River Hwang-Poo, below the shipping and harbour limits, but within the area of the Anglo-American settlements. The site has the advantage of being down the river, below the native city, foreign settlements, and shipping; and at the intake-well the risk of contamination of the water from these sources and from the creeks is avoided. The sewage from the settlements and native city, and the impurities from the shipping and from the creeks, are carried into the upper reaches of the river by the flood tide. The valves of the intake-well are so placed that, when opened, they cannot admit water until one hour after the flood tide has set in; therefore the water enters the settling reservoirs nearly at the top of the flood tide, when it is in its purest state; but the river was always in a turbid condition. There are two of these reservoirs, with an exposed water surface of 75,000 square feet collectively. Each reservoir is 250 feet by 150 feet by 13½ feet deep, with a total capacity of 6,130,312 gallons. The walls are constructed of concrete on the foreshore of the river, in one continuous slab for the entire circumference. The intake-well is a cast-iron cylinder, 6 feet in diameter, and is placed in the river 25 feet beyond low-water mark. The inlet-valves are bolted inside the cylinder, and have strainers outside; they are 2 feet above low-water mark. The total cost of the reservoirs (exclusive of the cost of land) was £11,058; being £1804 per million gallons capacity. The service-tank for feeding the filter-beds is 220 feet long, 92 feet wide, and 8½ feet deep, and contains 996,000 gallons of water. The walls are of brick; the floor is of concrete, 12 inches thick, laid on 12 inches of rough rubble. The tank is divided into three compartments, communicating by equalizing valves, so that the sediment can be flushed out of any one compartment while the others are in use. There are four filter-beds at present, having a total surface of 4266½ square yards; and each bed is designed to filter 30,000 gallons of water per hour. They are all 120 feet long, 80 feet wide, and 9½ feet deep, with 5½ feet of filtering material. The floors are of concrete, 12 inches thick, laid on 12 inches of rubble. The only particular in which the construction of the beds differs from the ordinary plan is the application of a special supply-valve for feeding the filters with water, so as to ensure a uniform head, which may be varied at pleasure. The average rate of percolation has been 540 gallons of water per square yard per 24 hours; and the average duty of each filter, 9,000,000 gallons before it requires cleaning. The clear-water covered service reservoir has a capacity of 840,000 gallons. It is 120 feet long, 80 feet wide, and 14 feet deep. Provision is made for diverting the water from the filter to the main pumping-well direct; also for shutting off the reservoir should it become necessary to do so. The main building is 180 feet long, 61 feet wide, and 20 feet high; it contains the engine-house, valve and gauge room, and an office. Under the same roof are the boiler-house, stores, and workshop. In consequence of the faulty character of the ground, the chimney for the main boilers, which is 103 feet high, is built on a foundation block of concrete, 20 feet square and 4 feet thick. The total weight on the foundation is 571 tons—equal to 3201½ lbs. per square foot. There are two sets of horizontal compound pumping-engines, each designed to deliver into the tower 75,000 gallons of water per hour; and two sets of duplicate centrifugal pumping-engines raise the water from the settling reservoirs to the high-level service-tank. There is also, within a few feet of the reservoirs, another independent engine and boiler house for a second set of centrifugal pumping-engines. Here there is a deposit-well and steam-engine for facilitating the clearing of the reservoirs of sediment. The cost of the Yang-Tsze-Poo pumping-station, inclusive of culverts, bye-passes, and valve-wells, but exclusive of the cost of land, has been as follows:—Service-tank, £1913, or £192 1s. 6d. per 1000 gallons capacity; filter-beds, £6056, or £1 8s. 6d. per square yard of area; service reservoir, £2938, or £349 15s. per 1000 gallons capacity; main building, £2567; and chimney for boilers, £798. Sluice-valves are placed on the pumping-main between the Yang-Tsze-Poo works and the water-tower, at an average distance of 500 yards apart. The mains extend to all the roads and streets in the settlements and suburbs. Their size varies from 18 inches in diameter on leaving the town, to 5 inches in the public roads and streets. In passages, courtyards, and alleys, the largest size is 3 inches; the smallest, 1½ inches. The aqueduct mains are 20½ inches in diameter. About 450 hydrant posts were placed in the roads and streets; and there are numerous private fire-valves. All house-fittings were supplied and laid by the Shanghai Water Company. Tin-lined lead service-piping for domestic supply is the only class used. None but screw-down draw-taps are allowed, and every service-pipe is provided with a stop-valve immediately inside the building it supplies; while another is placed in the street, at the boundary of the consumer's property, and is under the control of the Company only. Duplicate 12-inch meters record all the water passing into the French settlement. The water supplied to the American settlement is registered by a set of 8-inch duplicate meters; and there is a similar set at the boundary of the English settlement, where the mains cross the Defence Creek for supplying the suburbs. All the main-pipes, service-pipes, and sluice-valves are coated with Dr. Angus Smith's preservative solution, applied at a temperature of 600° Fahr. The cost of laying the pumping and the distributing mains, inclusive of all charges, per pipe of 12 feet, has varied from 19s. for a main 20 inches in diameter to 7s. for a pipe 5 inches in diameter. The total length of mains and service-pipes is nearly 39 miles, and their weight 5460 tons. One advantage of the water-works is the great reduction in fire insurance premiums; the direct aggregate annual saving to merchants and property-owners being not less than from £90,000 to £100,000. Formerly a limited supply of filtered water was delivered in carts to the houses of customers by a small local Company, at rates varying from 6s. 6d. to 13s. per 1000 gallons; whereas from the date of starting to December, 1887, the Shanghai Company's receipts for 2447 million gallons of water, delivered to the community on the constant-service system, have been at an average rate of 5·7d. per 1000 gallons. The Company was registered with a capital of £100,000, subsequently increased to £120,000; and a further augmentation to £145,000 will be necessary. This expenditure amounts to 17s. per head, exclusive of the native city and of the population afloat. The works were commenced in August, 1881, and were inaugurated for public service in July, 1883.

The works described in Mr. Orange's paper were originally projected in 1873, by Mr. J. Macneil Price, the Surveyor-General of the colony; but actual operations were not commenced until the beginning of 1883. The works were divided into four sections—the formation of a storeage reservoir at Tytam, by the construction of a concrete dam, together with bye-wash, &c.; the boring and completion of a conduit tunnel through the Tytam range of hills; the formation of a masonry conduit; and the construction of filter-beds and a service reservoir. The storeage reservoir is situated in the Tytam Valley, five miles from the city of Victoria. The height of the surface of the water above the sea is about 500 feet; the drainage area is about 700 acres; and the area of the reservoir, 27 acres. The latter contains 310 million gallons. The dam is constructed of Portland cement concrete, of different proportions. There is an inner and an outer facing of granite; and the mass of the dam has granite stones embedded in the concrete—the water-tightness of the work depending upon the thin skin of rich cement concrete next to the inner face. A valve-well, with five inlets into the reservoir, is constructed, and is divided into wet and dry compartments by a cast-iron mid-feather, so that the valves, &c., can be easily examined. A scour-pipe is fixed at the bottom of the dam communicating with the reservoir. The dam is 120 feet high, and contains about 66,000

cubic yards of materials. The bye-wash is built right away from the dam, and leads to a separate valley. It has about 100 feet clear waterway, over which a road bridge is built. The greatest observed depth of water over the bye-wash has been 4 feet. The total cost of the reservoir works was about £99,000. The water is conveyed to the tunnel inlet by cast-iron pipes. The tunnel is 2428 yards long, and about 7 ft. 6 in. square. Almost the entire length is through very close and hard granite. The boring was effected by means of some 3-inch machine drills, actuated by compressed air; the explosive principally used being dynamite. After a preliminary training by European miners, the work was carried out entirely by Chinese labour, and occupied four years. The cost of boring the tunnel was £48,269, equal to £19 7s. 7d. per lineal yard. The outside works raised the total cost to £53,950. From the tunnel outlet, the water passes to the conduit, which winds for a distance of more than three miles along the mountain sides, to the site of the service reservoir above the town of Victoria. The conduit is 3 feet wide and 2 ft. 6 in. high, and is built with a concrete bottom, brick sides, and granite cover stones; the sides and bottom being rendered with cement. Owing to the numerous ravines and gullies, there are about 100 bridges and culverts. The principal works are aqueducts of 21 spans of 20-feet arches, and double or 36-feet spans; there is also one heavy cutting 95 feet in depth through a hill spur. A small service reservoir, containing about 1½ million gallons, was constructed about the middle of the conduit. The principal quantities of work were about 30,000 cubic yards of excavation, 15,000 cubic yards of masonry and walling, and 1200 cubic yards of concrete; the total cost being £34,700. The conduit delivers the water to the filter-beds and service reservoir. The site for these latter works is extremely irregular. The filter-beds were constructed half in cutting and half by wall and bank; the cutting being 60 feet deep, and the wall up to 24 feet in height. There are six beds, each bed averaging 541 square yards. The filtering material is gravel and washed sea-sand. The service reservoir, which contains about 6 million gallons of water, is constructed across a ravine; three sides being in cutting, and one side a wall and bank 62 feet in height. The depth of the reservoir is 30 feet. The stream is taken under the reservoir in a culvert 16 feet wide. All the walls were made of local lime concrete; a facing of stone being used for the sides of the walls exposed. The principal quantities of this work were about 96,000 cubic yards of excavation, 11,000 cubic yards of walling and stonework, and 16,000 cubic yards of concrete; the cost being £22,761. The total outlay for the works described was £209,579—taking an assumed value of the Mexican dollar of 3s. 4d. All local payments are made in dollars. The Consulting Engineer for the reservoir and tunnel works was Sir R. Rawlinson; the Engineer-in-Chief was the Surveyor-General of the colony; Mr. J. M. Price, the author of the paper, was Resident Engineer, and prepared the designs for the conduit, filter-beds, and service reservoir, as well as all the working drawings.

The works for the water supply of Yokohama, described in the paper by Mr. J. H. T. Turner, were completed in October, 1887. This was the first undertaking of the kind in Japan. Its inception was largely due to the recognition by the Japanese Government of the close relation subsisting between the use of polluted water and the development of choleraic epidemics at Yokohama. The principal original features of the works are that they were constructed in a country subject to earthquakes, and to meet the peculiar requirements of a Japanese population. The source of supply is the River Sagami, which was tapped at a point about 28 miles distance from Yokohama. The water is raised from the river by steam-pumps, and is delivered into a depositing-tank built on the mountain side. It passes from this tank through a gauge-plate into the aqueduct, and flows by gravitation to the town. The upper portion of the aqueduct is composed of alternate lengths of 18-inch cast-iron main-pipe and masonry conduit, constructed along the precipitous rock wall of the Sagami canon. The hydraulic gradient of the first 18 miles of the aqueduct is 6 feet per mile; and of the last 9 miles, 14 feet per mile—the diameter of the pipe being reduced to 15½ inches. Lead joints are employed everywhere except at the river crossings, where flange joints are adopted. The main-pipe delivers the water to the filter-beds and service reservoir, which are situated at Yokohama, about 1 mile from the centre of the town. The filter-beds are three in number; two being ordinarily in use together. They were built of concrete. The filtering material consists essentially of a depth of 2 ft. 6 in. of sharp sand, supported in the usual way upon gravel, and underlaid by brick drains. The service reservoir is a concrete structure; the walls being faced with brickwork. The depth of water is 18 feet. Both the reservoir and the filter-beds, and all wells and tanks, are built upon, and entirely surrounded by, good puddle up to water-line—a feature of construction to which the water-tightness of all these structures is doubtless largely due, and which may be regarded as almost essential in earthquake countries. A system of bye-passes permits of the water being delivered direct to the town, without passing through either the reservoir or the filter-beds, if it is necessary to do so at any time. The distribution in the town is affected by a ramification of 4-inch and 8-inch pipes branching from an 18-inch main-pipe from the reservoir. The service is constant. Stand-pipes are largely used for the supply of the native portion of the town, and lead pipes are introduced into the houses of the foreign settlement. Fire hydrants are provided in large numbers; the fire-rate being levied over the whole population. The entire town is placed under the waste-water meter system, for the prevention of waste. Water is sold by measure to manufactories and shipping; the town being rated for all domestic supply. It may be added that the average charge per 1000 gallons is about 7d.; but although this is rather high, something like 73 per cent. of the population voluntarily became consumers as soon as the water could be delivered. The cost of the works per head of the population supplied was 30s., owing, of course, to the exceptional difficulties attending their construction.

Mr. George F. Warner, B.A., of St. John's College, Cambridge, elder son of Mr. W. J. Warner, of South Shields, was called to the Bar last Wednesday by the Honourable Society of Lincoln's Inn.

East London Water Company's Stock.—Tenders for £50,000 of the East London Water Company's 4½ per cent. debenture stock were opened last Tuesday, and the stock was allotted at prices ranging from £145 2s. 6d. to £139 10s. per cent.; the average price being £140 16s. 8d. The tenders submitted were for considerably more than the total amount of stock for disposal.

British Capital in American Gas Supply.—It will interest many of our readers to learn that the two great Anglo-American Gas Investment Companies, which have been in course of formation as rival enterprises, have been united. The combination will thus be the largest financial project with regard to gas supply that has ever been attempted, as it promises to be one of the strongest.

The Discoverer of Coal Tar Colours.—The Council of the Society of Arts have, with the approval of the Prince of Wales (the President), awarded the Albert Medal to Mr. W. H. Perkin, Ph.D., F.R.S., "for his discovery of the method of obtaining colouring matter from coal tar—a discovery which led to the establishment of a new and important industry, and to the utilization of large quantities of a previously worthless material." This medal was struck to reward "distinguished merit for promoting arts, manufactures, and commerce;" and it is awarded annually.

Sanitary Institute.—The twelfth congress of this Institute is to be held in the Pavilion Buildings, Brighton, from the 25th to the 30th of August, under the presidency of Sir J. Crawford, K.C.B., M.D. In connection with the congress, there will, as usual, be an exhibition of sanitary appliances and articles for domestic use and economy; and conferences of Medical Officers of Health and Inspectors of Nuisances will take place. The last day will be given up to excursions; and in the evening, Dr. B. W. Richardson, F.R.S., will address the working classes in the Town Hall. The exhibition, which will be held in the Corn Exchange, Pavilion Buildings, and Museum, will remain open till Sept. 13.

Death of Sir Warington Smythe.—We regret to record the sudden death, last Thursday morning, of Sir Warington Smythe, M.A., F.R.S., whose name will be familiar to many of our readers from his connection with coal and coal mining. In 1844 he was appointed by Sir Henry De la Beche to a post on the Geological Survey; and in 1851, on the formation of the Royal School of Mines in Jermyn Street, he became Lecturer on Mineralogy and Mining—retaining the former chair till 1881, and the latter to his death. In 1879 he was appointed Chairman of the Royal Commission on Accidents in Coal Mines, to the duties of which office he devoted much labour during the seven years that the Commission was sitting. For this and other public services, he received the honour of knighthood in 1887. Besides various technical reports and contributions to scientific literature, he published in 1867 "A Rudimentary Treatise on Coal and Coal Mining"—a standard work which has been translated into the principal European languages. The deceased gentleman, who was in his 73rd year, may be truly said to have died in harness, as he was present at the *soirée* of the Royal Society on the evening before his death.

The Testing of Iron and Steel.—If a fracture of iron gives long, silky fibres of a leaden grey hue, the fibres cohering and twisting together before breaking, it may be considered a tough, soft iron. A medium, even grain mixed with fibres is a good sign. A short blackish fibre indicates badly-refined iron. A very fine grain denotes a hard, steely iron, apt to be cold-short, and hard to work with the file. Coarse grain with brilliant crystallized fracture, and yellow or brown spots, denotes a brittle iron cold-short, working easily when heated. This iron welds easily. Cracks on the edge of bars are a sign of hot-short iron. Good iron is readily heated soft, under the hammer, and throws out but few sparks. Nitric acid will produce a black spot on steel; the darker the spot, the harder the steel. Iron, on the contrary, remains bright if touched with nitric acid. Good steel in its soft state has a curved fracture and a uniform grey lustre; in its hard state, a dull, silvery, uniform white. Cracks, threads, or sparkling particles denote bad quality. Good steel will not bear a white heat without falling to pieces, and will crumble under the hammer at a bright red heat; while at a middling heat it may be drawn out under the hammer to a fine point.

REGISTER OF PATENTS.

Vertical Gas-Retorts.—Hawkins, J. G., and Barton, J., of Peterborough. No. 5464; April 10, 1890. [11d.]

This invention in regard to vertical retorts (together with their lids and doors) is designed "to reduce the labour attending the charging and discharging of the same, in comparison with those made and set in the ordinary way, and by their use obtain an increased quantity of gas from a given quantity of coals."

Fig. 1 is a part front and part sectional elevation of a bench of six retorts, with a regenerative furnace beneath. Fig. 2 is a transverse sectional elevation of three of the retorts; the section being at right angles to fig. 1. Fig. 3 is a part plan and part sectional plan.

Fig. 1.

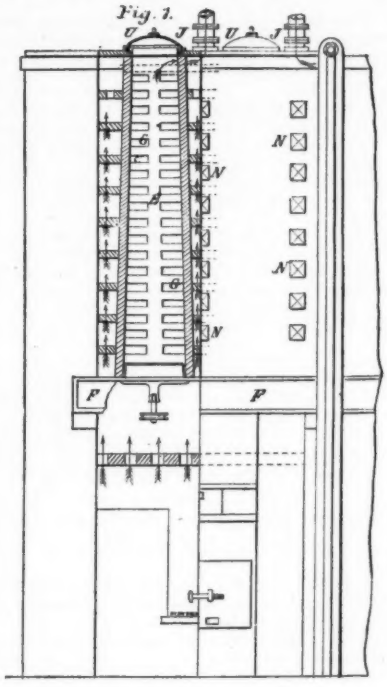
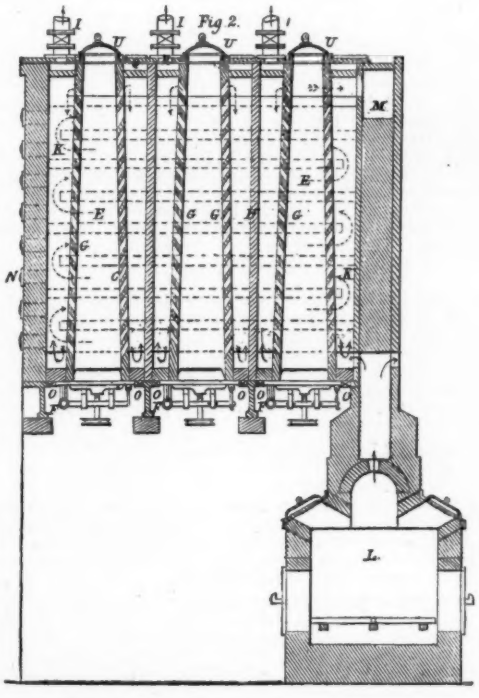


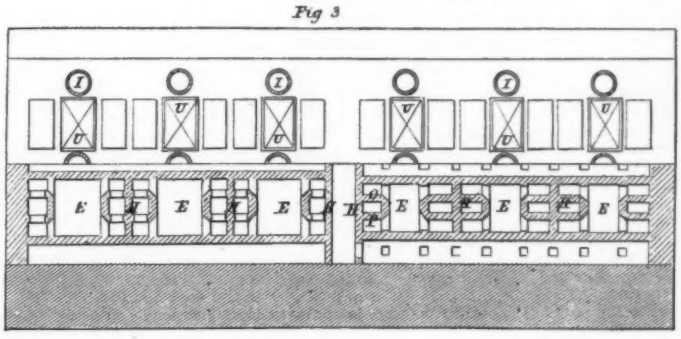
Fig. 2.



The retorts E are built of fire-bricks (some specially moulded, and some of the ordinary kind) upon girders F, or other suitable supports. The interior of each retort is built taper—the largest part at the bottom—and with a number of openings G in one or more of its sides; it being observed that each of the openings has an inclination upwards from the interior to the exterior of the retort. Between each retort there is a vertical partition H. By these partitions conduits are formed for the passage of the gas from the retort to the ascension-pipe I; the latter being furnished with valves or liquid seals at J, or other convenient position. Horizontal flues K lead the heat from the regenerator furnace L forwards and backwards on two opposite sides of the retorts, until it enters the main flue M and away to the chimney-shaft; sight-holes and plugs N being provided, as shown. Instead of the flue K running to and fro, as shown in fig. 2, once it is brought to the front of the bench, the heat may be allowed to ascend through openings or nostrils like those shown black in fig. 3. On the top of the setting there is a plate Q of cast iron, with openings R leading to the ascension-pipes, and an opening over each retort-mouth. Around each of the latter openings, a deep channel is formed by raised flanges; and into these channels are made to dip the flange of each of the lids U—a gas-tight joint being formed by partially filling the channels with loose sand. The upper part of the T-shaped girders F may have broad flanges, or there may be plates having suitable openings shaped and placed as shown. Upon these plates, resting upon the girders, the retorts are built; and they are kept from extending laterally by the flanges W. The bottom openings of the retorts are provided with doors, closed by a screw cross-bar actuated by a wire rope or chain which passes under a sheave, and is then led by other sheaves to the top of the retort-bed, where it may be fastened to a lever to be manipulated by the attendant.

The use of the apparatus is as follows: The regenerator furnace L being supplied with fuel, and the setting of retorts being suitably heated, the doors at the bottom of the retorts are closed, the lids removed, and the retorts charged with coal. The edges of the lids U are then thrust into the sand lute, when carbonization will proceed; the gases given off from the coal passing through the orifices or openings G into the conduits provided for the purpose. These conduits have over their upper ends loose fire-clay covers, which compel the gas as it issues from the openings G to pass downwards. Near the bottom of them an opening is made, communicating with the central conduit; and consequently the gas as it is made passes out from the openings G, goes over the top of the loose covers, along the gas-way underneath the plate Q to the ascension-pipe I, and away to the condensers or other apparatus. By thus keeping the gas for a time in close contact with the highly-heated conduits, it is claimed that it becomes permanently fixed; the result being more gas as well as less tar. If found desirable, the loose covers just referred to may be removed, thereby allowing the gas as it issues from the openings G to pass upwards direct to the ascension-pipes I, and without having to go downwards and up the central conduit. At the bottom of the conduits there are openings O provided with plugs or doors, through which all three conduits may be examined and cleaned when necessary. When the charge is worked off, the valve J (figs. 1 and 2) is shut. The lid at the bottom of each retort is then lowered, by manipulating the wire rope and causing the screw to turn until the lid touches the boss of the cross-bar. The door being thus lowered, the catch is thrust aside, when the cross-bar and door will swing down, and allow the coke to fall from the retort. When it becomes necessary to close the door, the wire rope is actuated by the attendant until the catch falls, or can be thrust over, the end of the cross-bar. The attendant then manipulates the wire rope, and causes the screw to revolve until by so doing the door is closed again.

Fig 3



Manufacturing Gas from Coal and Analogous Substances.—Dinsmore, J. H. R., of Liverpool. No. 10,488; June 28, 1889. [8d.]

This invention has chiefly reference to those processes of making illuminating gas in which coal or analogous material is distilled in closed retorts, and the resultant gas subsequently passed through a second retort or fixing chamber; the main object being to prevent the tarry or heavy non-permanent vapours existing in the gas from condensing as it leaves the retorts, and to convert them into permanent gas, and to do this in a bench of retorts wherein a fixing retort or chamber is common to a plurality of coal-distilling retorts. The gas as it issues from the retorts is not cooled by coming into contact with liquor, as happens in ordinary practice, but is passed through a "dry" valve, or valved chamber, on its way to the fixing retort or chamber (termed a "duct"), such as is used in the Dinsmore or like processes. That is to say, as regards such processes, a valve or valvular device is interposed between the retorts and the heating duct or chamber.

Fig. 1 is an outside end view showing a bench of gas-making apparatus according to this invention; and fig. 2 is a longitudinal section of a part of same.

The valve chamber C consists of a casing, plug, and branches connected to pipes communicating with the retorts A; one branch being joined to, and communicating with, the mouth of the fixing-retort D, while another one constitutes a bye-pass, through which the gas from the retorts passes to the foul main, when so desired. The foul main H is in connection with a branch of the valved chamber C by a pipe on one side; while by another pipe on the other side it connects with the artificially-cooled conduit E, by which the gases are cooled on leaving the duct D. There are two non-return valves, by which the flow of gas out of the foul main, and towards C, and to the outlet pipes,

Fig. 1.

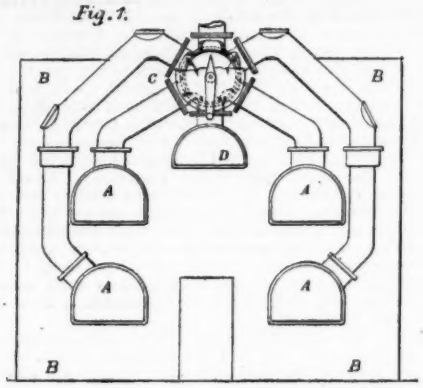
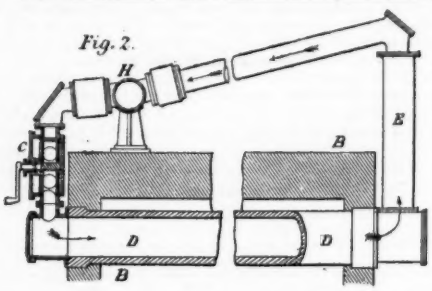


Fig. 2.

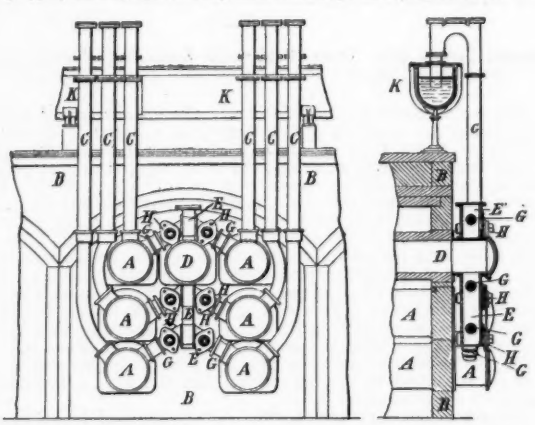


is prevented, but which allow it to flow into the foul main from these pipes.

In operation, the gas being distilled in the retorts A, and coming off from the coal in the ordinary manner, passes (under ordinary conditions) by way of their respective pipes into the chamber C. From here, also under ordinary conditions, it passes into the duct D; and then outwards therethrough—eventually finding its way into the foul main H. Now if a retort is not making gas, or has to be opened for any purpose, then, in order to prevent the outflow of gas from the chamber C, or inflow of air into the device, the aperture is closed by working the plug of the chamber C, so that its solid portion covers the aperture. To prevent, however, the gas flowing to the foul main H, when the plug of the valved chamber is not in this position, one valve is made heavier than the other one, so that it remains shut; the gas going to the foul main by the duct D and the lighter of the two valves. Then, if it is desired to bye-pass the gas from the duct D—that is, to cause it to pass direct from the chamber C to the foul main H, without passing by way of the duct D—the solid portion of the plug of the chamber C is moved so that the gas is free to pass up direct to the foul main. As access to the duct D is only rarely required, and for short durations of time—such as for scraping it, or examination of its state, and the like—it may be done (in cases in which this form of valved chamber is used) when all the distilling retorts are closed. The chamber C thus constitutes a multiple-way valved device, having a single solid portion for covering the apertures of the various branches, as described.

Manufacturing Illuminating Gas from Coal.—Carr, I., of Widnes. No. 11,104; July 10, 1889. [8d.]

This invention is for an improved form of plant for carrying out the Dinsmore process of manufacturing gas from coal—patents Nos. 1767, 7714, and 15,852, of 1887, and Nos. 2096 and 4885 of 1888.



The drawings show an end elevation and a longitudinal section of the arrangement of apparatus.

A are ordinary retorts set in a bench B in the usual way. C are ordinary ascension-pipes which form a communication between the retorts and the hydraulic main K. D is the "duct" through which the gases from the material distilled in the retorts are caused to pass, and wherein they are heated. E is the vertically disposed chamber or pipe to which the gases from the retorts pass on their way to the duct, G are the pipes which connect the retorts with the chamber or pipe E. H are the valves on such connecting-pipes, by which communication between the retorts and the chamber and duct, E and D, is controlled. The connecting-pipes are arranged at an inclination to the horizontal plane, with the object chiefly of causing any small quantity of liquid matters which might result from the condensation of vapour within them to pass away into the mouths of the retorts, and so prevent their becoming blocked. The form of the chamber E is in this arrangement rectangular; and it is in two portions—one above and one below the mouth of the duct. A door or cap is provided on the upper end of the chamber, by the removal of which access is at once had to the lower as well as the upper portion of such chamber, for the purpose of inspecting, scraping, or cleaning it. Other doors or caps are provided on the front of the chamber for the same purposes.

By this arrangement and construction of the connecting-pipes G, and the chamber E, a "straight-way" connection between the retort mouths and the chamber is provided, and facilities are afforded for scraping and keeping clean all the pipes and other internal surfaces—that is, the connecting-pipes G and the aperture of the plug-valves H can be readily scraped and cleaned from the retort mouths, and all scale, &c., is easily withdrawn. It is to be understood that the gas is cooled on leaving the duct, as in the ordinary Dinsmore process.

In operation, the retorts A are charged *seriatim*; and assuming all to be employed, the valves H are all open, and the heavy liquid seal on the dip-pipes in the hydraulic main K causes the gas to flow directly, by way of the connecting-pipes G, and vertical chamber E, into the duct D; and thus, by reason of the small length of time taken by the gas in its flow between leaving the retorts and entering the duct D and coming under the influence of the heat thereof, and the limited extent of cooling surface of the pipes and passages under the action of which it has to come before entering the duct, practically no liquefaction of condensable vapours in the gas takes place during the flow. Then, as soon as the gas comes under the action of the heat of the duct, the tarry vapours are heated and rendered to a great extent a permanent or fixed gas.

When it is required to open the duct for inspection or other purpose, the valves H are closed; the gas thereby being caused to flow up the ascension-pipes C to the hydraulic main K. Each of the valves H, of course, comes separately into action at the time of charging. Before opening the retort-door, the valve H of the connecting-pipe of that retort is closed, so as to prevent the back-flow of gas produced in the other retorts from the chamber E, and opened when the retort is closed.

APPLICATIONS FOR LETTERS PATENT.

8654.—Lux, F., "An improved regulating device for use with gas-burners." June 4.

8707.—Langer, J. von, and Cooper, L., "Improvements in and connected with gas-furnaces for metallurgical and other industrial purposes." June 5.

8768.—Ryland, F., "Improved main gas-cock; applicable also for other purposes." June 6.

8784.—Muller, J. A., "Improvements in liquid-meters." June 6.

8874.—Bliss, L., "A safety tap to gas brackets or other gas-fitting apparatus, called the 'Bliss safety tap.'" June 9.

8909.—Woodall, H., "Improvements in apparatus for charging inclined gas-retorts." June 9.

8930.—D'Iszoro, L. S., "Improved machinery or apparatus for charging and drawing gas-retorts." June 10.

8970.—Pointing, A. L., "Improvements in globe holders for gaseliers and the like." June 10.

9005.—Hooker, J. J., "Improvements in or connected with gas-burners, applicable to gas-stoves." June 11.

9041.—Bayly, J. P., "Improved means for carrying off leakage from gas-mains." A communication from H. Cowell. June 11.

9214.—Cloudesley, J. L., "Improvements in gas-meter indices, whereby the quantity and corresponding value of gas consumed is shown, and the reading simplified." June 14.

Increase in the Price of Gas at Walsall.—At a special meeting of the Walsall Town Council last Friday, the Gas Committee recommended that the price of gas be raised 3d. per 1000 cubic feet to each class of consumers, towards meeting the increased expenditure (estimated at more than £4000) caused by the large rise in the price of coal and other materials, and the extra amount paid to workmen for wages. It was estimated that this step would produce about £3000. The recommendation was agreed to.

Cleckheaton Local Board Gas Department.—The annual statement of accounts of the Gas Committee were presented at the meeting of the Cleckheaton Local Board last Tuesday. It showed that the amount of gross profit for the year was £3477 19s., as against £3243 the previous year. The estimated value of the gas supplied for public lighting in the Cleckheaton ward, for which no charge was made, was £285. These sums are equal to 8·47 per cent. upon the capital employed (£44,400), against 10·48 per cent. last year.

Monte Video Gas Company, Limited.—At an extraordinary meeting of this Company, held at the offices, Suffolk House, Laurence Pountney Hill, E.C., last Wednesday, the Chairman (Mr. A. K. Mackinnon) proposed—"That the following resolutions, carried at the general meeting held on the 30th of May, 1890, be confirmed, so as to make them special resolutions of the Company: 'That for the purpose of meeting the expenditure on new mains and other new works, and for other purposes connected with the business of the Company, the Board be, and they are hereby, authorized to borrow money on, and to issue debentures or debenture stock on such terms and conditions as they shall think fit: Provided always that the total amount of debentures or debenture stock at any one time issued and outstanding, shall not, without the authority of a general meeting, exceed £58,080. 'That the Board may convert the said debentures, or any of them, into shares of the Company, part of those already created, at such time or times, and on such conditions, as they may think fit, with the consent of the holders thereof.'" Mr. Simpson Rostron seconded the motion, which was unanimously carried.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Gadd and Pease Systems of Gasholder Guiding.

SIR,—In reference to your editorial note at the foot of my letter in your last issue, you are quite right in assuming I have some useful end to serve by my letters; and I think if you will again study your monitory remarks, you will discover the need of such end. *You*, by some strange process, accuse *me* of being the person "assuming judgment," when I simply stated the position taken by Mr. Pease. If that gentleman's method is not that contained in Mr. Gadd's specification (and has he not, forsooth, declared this is so), why, in the name of Fortune, should he seek to remove it, or where would be the objection? You are entirely at sea in saying that this is the point reserved for appeal. It is no such thing. I do not, however, now hope that you will be able to see the unjust conclusions you have—no doubt unknowingly—arrived at, as you appear to have a very imperfect understanding of the facts of the case.

W. F. MASON.

Longsight, Manchester, June 21, 1890.

[As our correspondent seems bent upon going counter to the old adage which lays down the principle that "no man is a judge of his own cause," it would be quite useless to continue this small controversy.—ED. J.G.L.]

Mr. West and the Assistant-Secretary of the Gas Workers' Union.

SIR,—I, like Mr. West, was not desirous of troubling you again but seeing the vague and shifty manner in which he deemed it fit to reply to what he calls "misleading and erroneous statements," I am in honour bound to reply, and once more tell Mr. West that, if my statements are misleading to him, they are not so to the Manchester men who read the JOURNAL, and also took part in the affair. Some of these men are willing to prove the veracity of my words.

To show how far wide of the true facts Mr. West steers, he says: "It had previously been the custom to make the men's time up to Friday night." Mr. West makes a mistake. It was Thursday night up to Friday morning, or how could he have two days in hand. Further, he mentions that endless mistakes arose. Quite so; but whose fault was that? Why, Mr. West's. When he got himself firmly established at Manchester, the first thing he did was to have the clerks and bookkeepers cleared out, who made none of those "endless mistakes," and brought his own young friends in their places—mere schoolboys from Maidstone. He says notice "was given of this alteration." I say that is a deliberate falsehood. Had notice been given, we dared not take the steps we took upon that Christmas Eve. I myself asked the Deputy-Manager, and also the head carbonizing foreman why we were not notified of the change; and they both in one voice said they had nothing whatever to do with it—it was all Mr. West's doings. If Mr. West was suffering from bronchitis when Mr. Rodgers came back from his house, and had he told us so, I have no doubt that he could have got us to work; but what he told us was that his son had come home from college, and, in fact, that is the excuse Mr. West himself gave me on the Monday following when he sent for me to explain. The Deputy-Manager came as soon as he was wired for. Mr. West says "no doubt Mr. Ward was one of the leading spirits." I admit I was the man who told Mr. Rodgers I would not handle a tool until I obtained an explanation. I deny it was a glaring breach of the Conspiracy Act, as the men were there ready and willing to go to work, if Mr. West had come and explained as those under him could not.

I see Mr. West confesses that he told Mr. Beale my propensities for stirring up strife. Ah, well, after all my knocking about I still live, and am able to combat Mr. West's "misleading and erroneous statements;" and I never yet have had to go through the poor man's method of bankruptcy—viz., have the brokers in.

I observe that Mr. West's letter is dated from Manchester. Now, if I am not out of place I would offer him a word of advice. I must admit he tried hard to make his machine a success. I for one do not blame him. This one at Beckton I believe is his forlorn hope. Mr. West should go back to his lathe, and preserve his health, because he nor any other man will invent a machine to supersede bone and sinew in the art of gas-making. He should take this tip from one who is both a practical and theoretical gas maker.

W. H. WARD, Assistant-Secretary,

June 19, 1890. Gas Workers' Union.

"Steam" Washers.

SIR,—We are surprised at your remarks in the last issue of the JOURNAL referring to the invention of the so-called "steam" washer by Mr. Greenall. This form of washer has been well known in Canada for the last ten years or more; and we ourselves have made them largely for nearly eight years past. The only invention is the absurd name. A very large proportion of domestic washing is done in lukewarm water; and where the "steam" comes in, is not easy to see. As a matter of fact, the clothes are saturated with water, and tumbled about; this being the actual process of the so-called "steam" washing. As to the other arrangements for drying and ironing, the whole of the apparatus necessary for laundrying and every other domestic service is fully described in our lists.

THOS. FLETCHER AND CO.

Warrington, June 19, 1890.

The Dangers of Electric Lighting.—Last Thursday morning, the mansion of Mr. R. D. Sassoon, in Belgrave Square, was the scene of a serious conflagration. It appears that the overheating of the electric light wires caused the ignition of the front room on the second floor, and an extensive fire was burning when the firemen were called. Four engines were soon on the scene; but the fire was not brought under control until much damage had been caused, not only to the second, but to the first floor by fire and cutting away, and to the upper part of the house and the contents by heat and smoke.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

During the past week the following progress was made:—

Bills read the first time: Huddersfield Water Bill; Local Government Provisional Order (Gas) Bill; Portsmouth Water Bill.

Bills read a second time and committed: Glasgow Corporation Bill; Huddersfield Water Bill; Portsmouth Water Bill.

Bill reported: Whitehaven Gas Bill (preamble not proved).

Bills read the third time and passed: Gas Orders Confirmation (No. 2) Bill; Water Orders Confirmation Bills (Nos. 1 and 2); Pontypool Gas and Water Bill.

HOUSE OF COMMONS.

Monday, June 16.

ELECTRIC LIGHTING PROVISIONAL ORDERS.

Sir M. HICKS-BEACH presented an additional Bill (No. 13) to confirm Electric Lighting Provisional Orders relating to Preston and Preston and Fulwood, and it was read the first time.

Thursday, June 19.

THE TRANSFER OF GAS AND WATER UNDERTAKINGS.

Mr. O. V. MORGAN asked the President of the Board of Trade whether local authorities have power to transfer gas or water undertakings, acquired by them by Provisional Order or Act of Parliament, without statutory powers; and, if not, whether the provisions the Board of Trade have inserted in Electric Lighting Orders before the House, enabling local authorities to transfer undertakings to be authorized by those Orders, are *ultra vires*.

Sir M. HICKS-BEACH said he was not aware that local authorities had any powers of transfer in regard to gas or water undertakings. Provisions had been inserted in the Electric Lighting Orders, granted this session, authorizing such authorities to transfer their powers and liabilities to any company or person with the consent of, and upon terms to be approved by the Board of Trade; and he was advised that such provisions were not *ultra vires*.

During the past week the following progress was made:—

Bills read the first time: Gas Orders Confirmation (No. 2) Bill Water Orders Confirmation Bills (Nos. 1 and 2).

Bills read a second time and committed: Bradford Corporation Water Bill; Electric Lighting Provisional Orders Bills (Nos. 5 to 7)—[see *ante*, p. 983]; Plymouth Corporation Bill.

Bills reported: Bury Corporation (Railway) Bill; Electric Lighting Acts Amendment (Scotland) Bill; London Subways and Overhead Wires Bill; Sutton, Southcoates, and Drypool Gas (Electric Lighting) Bill.

Bills read the third time and passed: Electric Lighting Acts Amendment (Scotland) Bill; Huddersfield Water Bill; Local Government Provisional Order (Gas) Bill; Portsmouth Water-Works Bill.

Petitions were presented against the Airdrie and Coatbridge Water Bill, from the Police Commissioners of the Burghs of Armadale and Bathgate; and against the Bradford Corporation Water Bill, from the Corporation of York, and the Knaresborough and Tentergate Improvement Commissioners and Local Board of Health.

Electric Lighting for Windsor.—The draft Provisional Order of the Windsor and Eton Electric Light Company, Limited, has been modified so as to meet with the approval of the Windsor Town Council. Under it the latter are to have power to purchase the Company's property within 21, 28, or 35 years, instead of 42 years.

Oswaldtwistle Local Board Gas Supply.—An inquiry was held at Oswaldtwistle last Wednesday week into an application by the Local Board for power to borrow £10,258 for works of gas and water supply, street improvements, &c. In the course of the proceedings, the Clerk (Mr. Sandeman) said the gas and water works were paying concerns, having made more than 4 per cent. on the original outlay. The Board charged 6d. per 1000 gallons for water for business purposes; and the rate for domestic purposes was about the same as in other towns. The price of gas was 2s. 8½d. per 1000 cubic feet; but a deduction was made if the accounts were paid within a given time. It was also stated that the greater portion of the money to be borrowed was to be spent on mains.

The Cookery Lectures at the Barnet Gas Exhibition.—The close of the gas exhibition at New Barnet on the 12th inst., noticed in the JOURNAL last week, was marked by a pleasant event which should have been recorded in connection therewith. A very important feature of the exhibition was the course of lectures on cookery, delivered by Miss Garstin; and at the final lecture of the series, she took the opportunity of expressing her indebtedness to the ladies for the attention they had given her throughout. She said she had endeavoured to demonstrate the comfort and ease with which cooking might be effected by gas, and trusted she had been able to impart information respecting culinary matters that would benefit and repay those who had favoured her with their presence. Mr. Thos. H. Martin, the Company's Engineer and Manager, having also thanked those who had attended, said these lectures had undoubtedly proved the advantage and economy of cooking by gas. Personally, and on behalf of those who had been present at the demonstrations, he had to thank Miss Garstin for the admirable manner in which she had carried out her programme, and shown the utility and efficiency of gas as a cooking agent. As a very slight token of the appreciation of her services, he had been asked, on behalf of several ladies, to beg her acceptance of a lady's companion, which he trusted she would receive as a gift prompted by the goodwill she had engendered during her first visit to New Barnet. Miss Garstin expressed her surprise and pleasure at the kindness shown; and a vote of thanks to her was proposed and carried by acclamation.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY AND THEIR WORKMEN.

Settlement of the Monthly Agreement Question.

Reason has ruled with the men employed in the manufacturing departments of The Gaslight and Coke Company; and they have determined to accept the monthly agreement, as modified. The signatures of four delegates of the Gas Workers' Union have been appended to the contract on behalf of the men; and as soon as the forms for each station have been printed, the agreement will come into operation. Having received permission from Mr. G. C. Trewby, the Engineer-in-Chief of the Company, to publish the agreement as it now stands, we do so below, as it may interest and doubtless be of service to many managers at the present time. The agreement, it may be mentioned, will require some slight alterations before being signed by the mechanics, as the Union with which they are connected will not allow them to do shovel work. These, however, are not of such a nature as to need specially printed forms.

THE GASLIGHT AND COKE COMPANY—Beckton Station.

AN AGREEMENT made the day of , 189 , Between The Gaslight and Coke Company, hereinafter called the Company, by , their authorized agent, of the one part, and hereinafter called the workman, of the other part, as follows:—

The said Company agree to take the workman into their employment, and the workman agrees to enter the service of the Company, upon the following terms and conditions:

1. The workman shall continue in the service of the Company for 28 days, to be reckoned from the date hereof; and the workman shall continue in the said service until the said service shall be put an end to by a 28 days' notice in writing to be given at any time either by the workman to the Company or by the Company, through their agent, to the workman, of his or their intention to determine the said service at the end of 28 days from the date of the giving of the said notice.

2. If the workman absent himself from his work or leave his employment, without giving the aforesaid previous notice to the Company, or their authorized agent, all pay which may then be due to him shall be absolutely forfeited to the Company, or if the workman shall neglect or fail to perform his work in any class or capacity in a proper manner, by reason of drunkenness or otherwise, or shall refuse or neglect to obey or carry out the directions of the foreman under whom he shall for the time being be working, or the directions of any officer of the Company, or if he shall at any time while on the Company's works be guilty of any misconduct, then and in any or either of the said cases, the Company, or their authorized agent, shall be at liberty to discharge the workman at any time without any notice; and the workman shall not be entitled to receive more than the proportion of wages which may be due to him up to the time of his dismissal in respect of the number of full and complete days during which he has actually worked, provided always that nothing in this clause, or done in pursuance thereof, shall prejudice or affect any proceedings which the Company may be entitled by law to take against the workman.

3. The workman shall observe and conform to all the instructions, rules, and regulations of the Company or their authorized agent which are or which from time to time shall be posted on the premises or station of the Company where the workman shall be employed.

4. The workman shall faithfully work for and serve the Company at the above station to the best of his skill and power, wherever his services may be required, either on piecework or in whichever of the classes or capacities specified in the first schedule hereto the Company or their authorized agent or officers may from time to time require him to serve, and at the rate of pay or wages specified for each class and description of work specified in the said schedule, or in the event of the workman at any time during this agreement being engaged on piecework, then at the rate of pay or wages specified for such work in the second schedule hereto.

5. All wages or pay payable under this agreement to the workman shall in every week be calculated and made up to the day and hour mentioned in the said first schedule hereto, according to the shift or class of work and capacity in which the workman shall have been engaged during the week, and the amount of such wages or pay shall be paid to him at the hour and on the day in every week mentioned in the said schedule, or on such other day or time as the Company shall from time to time appoint; and if the workman shall during any week have been employed in more than one of the classes or capacities specified in the said first schedule hereto, the rate of wages or pay in respect whereof vary, the said wages or pay shall be increased or decreased accordingly from the day that the class or capacity in which he shall have been engaged is changed for that of another class or capacity. All wages or pay payable to the workman under the second schedule hereto shall be calculated and made up, and be payable on the days and at the times therein specified, or such other days or times as the Company shall from time to time appoint.

6. In consideration of the capitation grant made by the Company in aid of the funds of The Gaslight and Coke Company's Workmen's Provident Society, the workman agrees forthwith to present himself for examination by the Medical Officer of the said Society, and to do all things necessary to become and continue a member of the said Society, so long as he is in the employment of the Company under this agreement, and to abide by all the rules of the said Society for the time being in force, and to pay all subscriptions and fines and other monies that may become due from him as such member under the said rules or otherwise; and it is hereby agreed that it shall be lawful for the Company, and the workman hereby authorizes and requests them, to deduct from the wages or pay from time to time due to the workman a sum equal to the subscriptions and fines and all other monies that may from time to time become due from the workman to the said Society as and when the same become due, and to pay to the said Society the amount so deducted.

7. It is, lastly, mutually declared that nothing herein contained shall be construed to exempt the workman from being liable to the laws now or hereafter in force in relation to masters and servants, except and so far only as such laws may be inconsistent with the terms of this agreement.

As witness the hands of the said parties

The First Schedule above referred to.

Firemen.	Scoop Drivers.	Stokers.	Coke Spreaders.	Coal Wheelers.		Labourers.
				Stokers.	Labourers.	
Per week of 7 days. 9 Fires. 39s. 1d.	Per week of 7 days. 24 Mouths. 39s. 1d.	Per week of 7 days. 24 Mouths. 37s. 4d.	Per Week of 7 Days 72 Mouths. 31s.	Per 4s. 3d.	Day. 4s.	Per Day. 4s.

All wages to be calculated and paid in every week as follows:—

1. Workmen engaged on first shift: Time to be made up to 2 p.m. on Thursday, and wages paid at 1.30 p.m. on Friday.
2. Workmen on second shift: Time to be made up to 10 p.m. on Thursday, and wages paid at 3.15 p.m. on Friday.
3. Workmen on third shift: Time to be made up to 6 a.m. on Friday, and wages paid at 5.30 a.m. on Saturday.
4. Day Workmen: Time to be made up to 5 p.m. on Thursday, and wages paid on Friday from 5 o'clock onwards.

Witness

The Second Schedule above referred to.

Piecework men: All time for piecework* (except coke men) to be made up at 12 noon on Thursday, and wages paid on Saturday mornin g, commencin from 9 a.m. The time of coke men shall be made up to 5 p.m. on Thursday, and wages paid about 2 p.m. on Friday.

Witness

* The nature of the work and the rate of pay will have to be added to this schedule, and signed by the workman, if at any time he shall be required to do piecework.

The Kent Patent Arc Lamp Company, Limited, is the title of an undertaking registered with a capital of £10,000 in £5 shares, to acquire any patents, licences, or concessions in connection with electric or other lighting or illuminating purposes, in accordance with an agreement made between Messrs. J. Kent and Salter.

The Drainage of Guildford.—A limited competition for the drainage of the county town of Surrey has recently taken place; four engineering firms having submitted plans in response to the invitation of the Guildford Corporation. The competitors were: Mr. W. H. Radford, Assoc. M. Inst. C.E., of Nottingham; Mr. F. Beesley, M. Inst. C.E.; Mr. F. Wentworth Shields, M. Inst. C.E.; Messrs. Shone and Ault; and Mr. C. N. Laily, Assoc. M. Inst. C.E., of Westminster. Pumping will have to be resorted to in order to raise a small portion of the sewage to a suitable elevation for treatment. Four of the engineers advocate the purification of the sewage by the "International" process, which consists in adding ferous carbon to the sewage, and allowing subsidence to take place in suitable tanks; the sewage being then passed through filter-beds composed of sand, gravel, and rustless magnetic oxide of iron in a highly porous condition. Mr. Wentworth Shield's recommendation embraced treating the sewage upon land. The plans prepared by Mr. C. N. Laily have been selected by the Committee appointed by the Corporation as the best suited for the town; and in these plans the "International" process will be carried out. Mr. Lailey designed the sewage works at Acton, at which place this process was first put into operation more than three years ago. The total cost of the works included in his scheme is £22,408; and his design has received the approval of Sir J. Bazalgette.

Electric Lighting at Brixton.—Two important advances in electric lighting are taking place at Brixton, and both are novelties. One refers to the Brixton Estate, where there have been erected close to the railway station a number of dwelling-houses and shops, and which will be lighted throughout by electricity supplied from a central station constructed on the estate. The second instance is near Kennington Park, where a number of shops and houses are being built, which will be electrically lighted, also from a small central station.

The Purchase of the Warrington Water-Works by the Corporation.—At a special meeting of the Warrington Water Company, held last Thursday, the proposal of the Town Council for the purchase of the Company's undertaking was accomplished. The Corporation have agreed to buy at a sum equivalent to 30 years' purchase of the maximum statutory annual dividends on the present paid-up capital; and also to pay £3000 to cover the costs of transfer, winding up, &c. The total sum to be paid by the Corporation is upwards of £250,000.

Extension of the Romford Gas-Works.—The business of this Company having greatly increased, it has been found necessary to erect new works on an entirely different site, plans for which have been prepared by the Company's Engineer (Mr. W. D. Child). Already a railway siding has been laid, connecting the new site with the Great Eastern Railway main line. A gasholder tank is in course of construction by Messrs. Docwra and Son; and the gasholder and framing, as well as the ironwork in connection therewith, are in course of construction at the works of Messrs. R. and J. Dempster, of Manchester, who will erect them on completion.

THE LEEDS CORPORATION GAS COMMITTEE AND THEIR STOKERS.

The men employed in the retort-houses at the Leeds Corporation Gas-Works have resolved to offer a determined resistance to the regulations recently promulgated by the Gas Committee, to which reference was made in these columns last week. The men contend that the new code will involve an increase in labour to the extent of 37 per cent., without any additional payment, and decline to regard as a concession the proposed regulation concerning the removal of the coke and ashes. A meeting of between 500 and 600 persons was held on Holbeck Moor on Sunday morning of last week. The principal speaker was Mr. Cockayne, the local Secretary of the Gas-Workers' Union. He dealt chiefly with the remarks of Alderman Gilston, the Chairman of the Gas Committee, at the last meeting of the Council (*ante*, p. 1081), pointing out that, when the deputation of the men waited upon the Committee, the promise was made that they would not take any advantage of the workmen in consequence of the position they then took up, while at the present time the amount of work which they were attempting to impose upon the men was such that they could not possibly get through. He argued that there was no truth in the statement of Alderman Gilston as to the dual responsibility in attending to the fires, and said that the heats were better maintained now than they had been at any previous period in the history of the gas-works. With reference to the remarks of Mr. Henry, the speaker said that that gentleman had promised that no attempt would be made to alter the then existing conditions, and that when the rules came to be published, they would be found to be satisfactory; whereas it was now sought to bind the men for four months every year—from October to February—which would place them in such a position that they would be unable to resent any work which might be imposed upon them. During the summer months, the regulation would have no binding effect upon the Committee to keep the men employed. Resolutions were adopted by the meeting and by a similar gathering on Hunslet Moor in the afternoon, pledging those present to use their best endeavours in assisting the gas-workers to resist the attempt of the Committee to impose extra work upon them.

A meeting of the Gas Committee was held yesterday week, at which the question of the new regulations, and the resistance of the workmen thereto, was discussed. It was resolved to give 14 days' notice to all firemen and stokers employed at the gas-works, to expire at the end of the present month. This step will not, however, it was stated, prevent any man returning to work who wishes to do so, providing he agrees to the new code of rules, which comes into operation on the 1st prox. In cases where applications are made for re-employment, it is understood that the applicants will be allowed to return to work. A Sub-Committee was appointed to deal with the matter and carry out the resolution. The same evening and on the following morning notices were served upon the stokers and firemen. The men had been invited that legally they would not be able to leave work without giving notice; and if the Committee had not taken this action, they would have handed in their notices. At the different gas-works, the workmen were informed that if they desired to work under the new regulations they must apply to the Manager by noon on Thursday. It is stated that the yard-men can cease work without any notice, and that they intend to support the stokers and firemen in resisting the fresh rules.

Thursday passed away without any of the men signing the new regulations; so that it may be assumed that all who have not accepted these terms have received the fortnight's notice. Upon the question as to how many, if any, workmen have agreed to the new rules, the Committee are very reticent; and at the close of their meeting on Thursday afternoon, at which the Managers of the gas-works were in attendance, the Chairman (Mr. Alderman Gilston), possibly from motives of prudence, declined to furnish any information whatever to the representatives of the Press as to the present state of affairs. The opinion of the officials of the local branch of the Gas Workers' Union is that every man will remain firm, and accept no compromise; and so far as their inquiries go, it is asserted that not a single one has availed himself of the opportunity to sign the rules. It is also said that the yard and purifying men have been threatened with dismissal if they did not themselves signify acceptance of the terms, and that they have refused to do this, though expressing themselves willing to work on to the end of the month. In one or two instances, it is stated that men have been paid off and discharged.

The Electric Lighting Scheme for Wimbledon.—A meeting of ratepayers and owners of Wimbledon has been held to hear an explanation with regard to the scheme for lighting the parish by electricity. The Chairman of the Local Board (Mr. J. Townsend) presided; and he attributed the present lighting of the streets by petroleum to the "high-handed action" of the Mitcham and Wimbledon Gas Company some six years ago. He contended that the oil light was as good as gas, and that it saved the parish £1200 a year. He mentioned this to show that the Board had always done their best to keep down the rates; but seeing the "growing importance and popularity" of the place, he held that if there was a parish in the whole of the kingdom that could afford to have electric lighting, Wimbledon was that parish. Mr. A. Holland, the Chairman of the Electric Lighting Committee, candidly admitted that the present oil-lamps were not illuminants, but only guides. It had been asserted that £30,000 would not be sufficient to carry out the scheme; but an expert assured him that it could be done for £26,250. The Committee, he said, were satisfied that the project would bring in a large revenue to the rates if they could keep the price at 6d. or 8d. per unit. There was a great deal of opposition at the meeting from ratepayers; and one or two awkward questions were put to the Chairman. One gentleman said it appeared to him the Local Board were plunging into uncertain speculation; and another advised them to beat a speedy retreat. On the meeting being asked to signify their approval of the scheme, only four or five hands were held up; while some 600 persons expressed their disapproval. The Chairman attempted to address the meeting again; but those present would not hear him, and the proceedings terminated in confusion.

MANCHESTER CORPORATION GAS SUPPLY.

The Proceedings against Mr. Norbury Williams.

At a Meeting of the Manchester City Council last Wednesday—the Mayor (Mr. Alderman Mark) presiding—the Town Clerk reported that, in pursuance of the resolution passed by the Council on May 7 last, he addressed a letter to Mr. Norbury Williams, informing him of the terms of the resolution—viz., that unless Mr. Williams could substantiate the charges he had made, proceedings would be entered against him; and asking him to make good his charges accordingly. Mr. Williams replied, stating that he had brought no charges against any member of the Council or any present official of the Corporation, and that he had requested his Solicitors (Messrs. Hinde, Milne, and Bury) to accept service of any process the Council might think fit to issue. The correspondence was submitted to Dr. Blake Odgers, who thereupon stated that in his former opinion, dated April 24, 1890, he advised the Corporation to take civil proceedings for libel against Mr. Williams in respect of his letter to the press of April 12. Mr. Williams had not thought fit to avail himself of the opportunity afforded him by the Corporation of proving the allegations contained in his letter, and substantiating his charges; and had also stated that he did not feel called upon to make any further statements on the subject; and he referred the Council to his Solicitors. Dr. Odgers, under the circumstances, advised that, without further communication or delay, a writ be issued in the High Court, with the Mayor, Aldermen, and Citizens of Manchester as plaintiffs and Mr. Williams as defendant. On May 20, a writ commencing an action in the Queen's Bench Division was issued, and appearance therein had been entered by the defendant's Solicitors. The Mayor moved that the report be entered upon the minutes and approved. Mr. Rawson seconded the resolution, which was passed unanimously.

THE CARDIFF CORPORATION AND THE PURCHASE OF THE GAS-WORKS.

The Proposal Defeated.

A Special Meeting of the Cardiff County Council was held yesterday week—the Ex-Mayor (Mr. Alderman D. Jones) presiding—to consider the report of the Sub-Committee relative to the proposed terms for the acquisition by the Corporation of the gas-works (see *ante*, p. 796).

Mr. Vaughan, in the course of a long statement, referred to the steps which were taken by the Corporation some three years ago, when the Company had a Bill before Parliament, to acquire the gas-works. A Special Committee, appointed to consider the matter, offered the Company 25 years' purchase; but this was promptly declined, and the negotiations fell through. The Lighting Committee had not got on very well with the Company in reference to the lighting and maintenance of the borough lamps; and the latter, on the other hand, complained that the former were too arbitrary and too exacting in requiring the exact fulfilment of the Act of Parliament. Deputations waited on the Committee to make such representations; and it was said on all sides that it was a pity the gas supply was not under the control of the Corporation. Then the Sub-Committee waited on the Directors, and asked on what terms they would sell their works. That report was before them; and it was now for them to accept or reject it. But the first question which presented itself was this—Was it desirable to acquire the works? By the purchase they should have the control of the public lamps. But they were met with the plea that electric lighting was going to supersede gas. The same was said seven years ago; but what had been the result since? After experiments during the past ten years with the electric light, gas was still the most widely used illuminant. He estimated that in a very few years they would be making in Cardiff an annual profit of £5000 or £10,000. They should remember that 27 years' purchase now was not more than 25 years' purchase 25 years ago. A shareholder then might have invested his money at 4 or 4½ per cent. Now he could only secure on a safe investment about 3 per cent. He concluded by moving a resolution approving of the terms.

Mr. Carr seconded the resolution.

Mr. Trounce proposed as an amendment—"That, having regard to the important and great changes which are being made at the present time in the public and private lighting of large towns and centres of industry, the Corporation do not consider this to be an opportune occasion for purchasing the Cardiff gas-works." The main point, in his opinion, was the sum proposed to be paid for the undertaking, which he regarded as altogether out of reason and extravagant in the extreme. It amounted to 29 years' purchase. It had been said by some gentlemen who supported this scheme, that other towns had paid more than Cardiff proposed to do. He flatly contradicted the assertion. The sum proposed to be paid was £505,000. The largest amount of receipts in one year was £78,631; the gas sold to consumers amounted to 453,413,100 cubic feet; and the length of mains was 95 miles. At Oldham the capital spent in the purchase of the gas-works was £367,121; the receipts for gas were £106,318; the quantity of gas sold was 783 million cubic feet; and there were 200 miles of mains. Thus Cardiff was far and away behind the figures of that town. At Manchester the capital was £1,370,000; and their receipts should be three times more than those of Cardiff. A third of their receipts came to £150,000—the gross being £453,000; and they sold 2797 million cubic feet of gas. A third of that would be 932 millions; but Cardiff sold only 453 million feet. The length of mains in Manchester was 669½ miles. At Birmingham the capital was £2,326,204, or nearly five times more than that proposed for Cardiff; and the receipts were £487,576. One-fifth of this would be £97,000, whereas in Cardiff they were only £78,000. A fifth of the gas sold would give 689 million cubic feet; while the quantity in Cardiff was 455 millions. At Southport the capital was £556,328; the receipts were £142,410; and sale of gas, 807 million feet. The Corporation in purchasing the works would, he contended, be committing a gigantic blunder. The Gas Company should be allowed to remain in their present position; and the Corporation should look forward to lights of a more modern kind.

The TOWN CLERK announced the receipt of memorials in favour of the convening of a public meeting to discuss this subject, from the Cardiff Ratepayers' Association, and from about 262 ratepayers.

Mr. BEAVAN, in seconding the amendment, said from a ratepayer's point of view they ought to hesitate before taking such a heavy responsibility as that of spending half-a-million upon the purchase of the gas-works.

Mr. CARR, in supporting the motion, expressed his hostility to all monopolies in the town; and he considered it highly improbable, however great the improvements in water gas, petroleum, or electric lighting might be, that the Council would even sanction the general pulling up of the streets to lay mains and to make house connections. In regard to the question of finance, if Cardiff were going to remain in its present condition—if there were no chance of its development—then he would frankly admit that he should have great difficulty in giving a vote in favour of Mr. Vaughan's proposition. The margin of profit—£3000 or £4000—would be too small to justify them in investing so large a sum of money as £500,000 in the purchase of the Company's property. But a trading corporation ought to realize more profit on such capital; and it was because he believed in the future of Cardiff that he supported the resolution.

Mr. REES said it was highly desirable that the monopoly of gas supply for certain reasons should be in the hands of the Corporation, and that the profits made should go towards the reduction of the rates. If he saw the profits appearing in large figures before him, he fancied he should feel greatly tempted; but he candidly confessed that he was not tempted by the profits which had been mentioned. If he were a director, he should consider himself somewhat lucky in getting rid of something with which there was associated a certain amount of risk, at the figure which had been named. In respect to the £3715 per annum which had been mentioned, they must look at the contingencies. The chief of these was the replacement of plant and appliances, which, having been in existence since 1837, he thought must be very antique. They would have to be replaced by modern appliances if they wished to keep pace with other towns in the production of gas in regard to cheapness and purity. They must also consider the possible rise in the price of coal and labour. It would perhaps be asserted that they would have the power to raise the price of gas to 3s. 6d. per 1000 cubic feet; but that would be a very serious thing to do in the interests of the ratepayers. On the whole, he did not think they should entertain the proposed purchase.

Mr. VAUGHAN said the last speaker had referred to the Bute Terrace works as being antiquated. The Committee were assured by the Engineer that the Company had spent £60,000 in re-arranging the plant. The old retorts had been taken away; and the works were now equal to those at Grangetown.

Alderman CORY felt that after what had been said there that afternoon, even if the Company had spent double the amount on renewals and extensions, the Sub-Committee had erred in judgment in recommending that they should give such a large figure for the concern. Gas was being superseded by electricity and other things; and there could be no question, looking to the increased quantities brought into this country, that petroleum would be used more and more in shops as well as in private houses. It would very largely supersede gas; and for the reason that it was more economical. They would be wanting in duty to their constituents if they agreed to purchase the undertaking at such an exorbitant price.

Mr. SHACKELL said it seemed to him to be an arbitrary proceeding to fix 27 years as the number of years to govern the purchase. He favoured the idea of having the question adjourned until a competent engineer had made a valuation in a proper way.

The DEPUTY-MAYOR, commenting on a paragraph in the Committee's report which said they had power to increase the cost of gas supposing the present profits were not maintained, said that, to his mind, was a very weak argument. It was very certain that as soon as the Corporation (if they ever did) became possessors of the Gas Company's rights, every ratepayer would at once become a shareholder in the concern. To tell these people that they could tax them in order that a certain dividend might be maintained was not very consoling to them. The Committee assumed a surplus of £3715 upon the transaction, and this was to be the money with which they would pay the redeemable stock. It was also necessary to create a sinking fund for the payment of these moneys; but for this no provision had been made. Supposing also they had a rise of only 5 per cent. in the price of coal from this time forth, would not the profits be proportionally decreased? Labour too was getting dearer. Last half year the Company used 27,846 tons of coal. Five per cent. upon this would be £1392. If they deducted £635—the surplus left to them after the sinking fund—there would be at once a deficiency in the accounts of about £750. He believed there was a prosperous future for Cardiff, and that possibly in years to come the Gas Company's works, even put at the price which they were now offering for them, might eventually become profitable; but at present, as a business transaction, he did not think they were doing right in buying them at the price which had been asked.

Mr. VAUGHAN said the Chairman had complained that they did not put forward in their report anything about a sinking fund, and what it would cost. It was not their duty to do it. They were appointed to approach the Directors of the Company, and ascertain the terms at which they could purchase. The Company for the past ten years had paid maximum dividends; and there was no doubt that they always would.

The amendment was then put, when 17 votes were recorded in its favour and only 5 against it.

Mr. RICHES remarked that many of them voted for the amendment simply in antagonism to the original resolution, but not to close the door against further negotiations. He, therefore, proposed as an additional amendment that the further consideration of the matter be referred back to the Committee with a view of endeavouring to get a reduced price from the Company.

This amendment having been seconded, a show of hands was taken, and 12 voted for it and 11 against; and it was declared carried.

A requisition has been sent to his Worship the Mayor of Cardiff from the local Ratepayers' Association, to call a public meeting as early as possible to discuss the proposal to purchase the gas-works, if the Corporation decide to proceed with the scheme. This is supported by about 250 ratepayers outside the Association, who have also signed a requisition, and another by those who are supplied with the electric light, asking the Council to refrain from taking from them the privilege of using the light for their various business requirements.

THE PUBLIC LIGHTING OF BARNSLEY.

The Gas Company's Tender Accepted.

At last Tuesday's Meeting of the Barnsley Town Council, the minutes presented by the Park and Lighting Committee showed that Mr. B Holmes, electrical engineer, had given information as to the tenders for supplying an electric lighting plant. A letter from the Manager of the Barnsley Gas Company (Mr. Hutchinson) had also been received, stating the terms upon which they would enter into a new contract for the lighting of the street-lamps; and as these terms were substantially the same as those agreed to by the Council, the Committee recommended them for the acceptance of the Council, subject to an agreement being entered into terminable by six months' notice (given by either party to the other), expiring on June 30 or Dec. 31 in any year. Mr. Halton asked if the Committee would now give some particulars respecting the movement for providing the electric light. Alderman Blackburn said the Committee had been investigating the question as cautiously and carefully as they could. Mr. Holmes had examined the district proposed to be lighted. They had received tenders; and were asking for more detailed schedules before bringing the matter before the Council. Whatever the Council and the Committee did would depend upon the Board of Trade, whether they could allow them to accept the tender of the Electric Lighting Company. One tender had been recommended by Mr. Holmes as being the best scheme they could adopt for the town. Before, however, the Committee would place the report before the Council, it would require further investigations. They, however, proposed to lay it before the Council in about a month's time. As to the contract with the Gas Company, the Committee felt that, under the circumstances, there was no alternative to accepting their terms. The only alteration was as to the six months' notice. In answer to a member, Alderman Blackburn said that at the present time the Council paid £1790 a year for gas. Under the new contract, they would have to pay £2081, or nearly £300 a year more. The minutes were passed.

GAS-LIQUOR WORKS AND THE ALKALI ACT.

The Sub-Inspectors' Reports.

In the JOURNAL for the 3rd inst., we gave an epitome of the twenty-sixth annual report of the Chief Inspector under the Alkali, &c., Works' Regulation Act, 1881 (Mr. A. E. Fletcher). We have now to notice the reports made to him by the Sub-Inspectors of the seven districts into which the entire area under his supervision is divided, viz.—(1) Ireland, Mr. W. S. Curphey, F.I.C., F.C.S.; (2) North of England, Mr. B. E. Smith, F.I.C., F.C.S.; (3) Cheshire, North Wales, and part of Lancashire, Mr. E. G. Ballard, with whom is associated Mr. J. Affleck, M.A., D.Sc., as an additional Inspector for the Widnes sub-district, comprising Widnes and Runcorn; (4) East Lancashire and Yorkshire, Mr. R. Forbes Carpenter, F.I.C.; (5) South Midland, Mr. E. Jackson, F.I.C., F.C.S.; (6) South-West of England and South Wales, Mr. A. C. Fryer, Ph.D., M.A.; (7) South of England, Mr. Brereton Todd, assisted by Mr. F. N. Sutton, F.I.C., F.C.S. Scotland—divided between Dr. Blatherwick and Mr. W. S. Curphey—is, as usual, the subject of a separate report.

In Ireland there are 21 sulphate of ammonia works, in which 2511 tons of sulphate were made last year. This is an addition of four works; but the quantity of sulphate produced was practically the same as before. The works in which the noxious gases evolved during the manufacturing process continued to be destroyed by fire were only small ones; and in such cases it was not deemed expedient to press for the adoption of oxide of iron purifiers.

There are 1 gas-liquor and 33 sulphate of ammonia works in the North of England district; but from none of them is sulphuretted hydrogen discharged as such into the air. At 19 works oxide of iron purifiers are employed as the means for decomposing it; while at the remainder it is either removed by means of wash-towers, or else burnt under boiler fires or under the retorts in gas-works. The quantity of sulphate made at the works in the district during the past year was 3796 tons, of which 382 tons were obtained from the ammoniacal liquor of patent coke-ovens.

In the district under the supervision of Mr. E. G. Ballard—embracing Cheshire, North Wales, and part of Lancashire—there are 5 gas-liquor works, and 28 in which sulphate of ammonia is produced. All the former were well conducted last year; and there was no cause of complaint of the escape of sulphuretted hydrogen from them. The sulphate works, too, were all carefully carried on. The continuous system of distillation is steadily displacing the old intermittent system, which is fast losing ground in the trade. The Inspector says the greater regularity in which the sulphuretted hydrogen is evolved by the continuous system, renders it much to be preferred to the intermittent method, as it enables this noxious gas to be more easily and completely absorbed. The total amount of sulphate made in the district last year was 4160 tons. In the Widnes and Runcorn sub-district, over which Mr. Affleck presides, there are five works provided with plant for the manufacture of sulphate and muriate of ammonia; and together they produced last year 1290 tons of sulphate. This gentleman devotes a large portion of his report to a consideration of the Chance sulphur-recovery process, the adoption of which in his district has led to an outlay of something like £150,000 for plant in the 18 months ending with December last. He describes the process as one which not only gives most perfect results in the extraction of the sulphur from alkali waste, but one which, with ordinary attention, need not be productive of any nuisance.

The Inspector for the East Lancashire and Yorkshire district (Mr. R. Forbes Carpenter, F.I.C.) states that the department of gas-liquor works was the only one in his district showing an increase last year; the total number of works making sulphate and muriate of ammonia being 55, against 54, and of liquor ammonia 18, against 17 in 1888. The total quantity of ammonia manufactured into sulphate, muriate, liquor ammonia (crude and refined) was equivalent to 22,483 tons of sulphate. As regards the methods of dealing with the foul gases evolved, the Claus process received further extension; being employed last year in six works, as against four in 1888. It dealt with 21 per cent. of the total sulphuretted hydrogen evolved; 27 per cent. being treated by combustion, and the remaining 52 per cent. by means of oxide of iron in special purifiers. There was very little change last year in the proportion of manufacture carried on by the continuous process as compared with 1888. The new works registered all adopted it; but not much impression was made in the older works, where the intermittent method remained in use during the year—the figures being 89 per cent. and 11 per cent. respectively, as the proportions of sulphate made by the continuous and intermittent processes.

In Mr. Jackson's district, embracing the South Midlands, the manufacture of sulphate and muriate of ammonia, and the concentration of gas liquor, were carried on in 60 works. The methods of dealing with the noxious gases generated were, in the main, the same as described in previous reports. In the majority of the works, the open oxide of iron purifier was employed. In four works, representing 34 per cent. of the gas liquor treated in the district, the sulphuretted hydrogen was burned for the production of vitriol; and, if skilfully performed with well-arranged plant, this can be done with a satisfactory consumption of nitre and moderate chamber space, yielding one-fifth of the vitriol required for the manufacture of the sulphate. In two cases the foul gases were passed into the hydraulic main; and the extension of this method, where the gas-purifying area is ample, might, Mr. Jackson thinks, be followed with advantage. At one works, where the treatment of the sulphuretted hydrogen presented special difficulties, the subject has lately been receiving careful consideration; and plant is now in operation for arresting the gas in vitriol produced from arsenical pyrites. In two works where the Claus process for dealing with the sulphuretted hydrogen has been adopted, as far as the suppression of all noxious gases is concerned, the apparatus has been quite efficient; but the sulphurous acid and sulphuretted hydrogen leaving the sulphur chamber, and passing into the purifying plant, have been variable as hitherto. At one of these works, no less than 32 tons of sulphur were recovered last year. Since the erection of a new and larger kiln, and the consequent decomposition of all the sulphuretted hydrogen at a much lower temperature (which experience has shown to be necessary), very much better results as regards exit gases had been obtained, and a considerably increased yield of sulphur was anticipated. At the other works, rather more than 100 lbs. of sulphur were obtained per ton of sulphate produced. Each ton of coal yielded 27 lbs. of sulphate; thus, for every ton of coal carbonized, about 1¼ lbs. of sulphur were recovered in the Claus chamber. The final purifier at these works was of ample dimensions, and had been in use for 18 months without changing the oxide of iron. The noxious gases from 8 per cent. of the gas liquor treated in the district were dealt with last year by the Claus process. Two new works for the manufacture of sulphate of ammonia were registered during the year. Messrs. R. and J. Dempster's continuous still, supplied with a water-cooled condenser and an open oxide purifier, was erected in one case. At the other works, where the liquor treated was derived from modified beehive coke-ovens, Simon's still was put in. The liquor was found to contain only a trace of sulphide of ammonium; oxidation of the sulphur appearing to take place in the oven.

Mr. Jackson states that in his district the continuous method of distilling gas liquor is fast replacing the intermittent plan.

Dr. A. C. Fryer reports that in the South-West of England and the South Wales district six new works were registered during the past year; one being for the manufacture of sulphate of ammonia. At the close of the year, there were 60 works registered in which the manufacture of muriate and sulphate of ammonia was carried on, and these produced 6720 tons of salts of ammonia. In some of the works where sulphate is made, the noxious gases were still destroyed by burning. However, the number of works where oxide of iron purifiers are in use is steadily increasing; and during the past year five works adopted this method of dealing with the offensive gases. A little more than 75 per cent. of the total sulphate and muriate manufactured in the district was made by the continuous, and only 25 per cent. by the intermittent process. During the year four works adopted the former method. The Inspector makes special reference to Mr. Bowen's process for the manufacture of sulphate of ammonia, as carried on at the works of the Bowen Patent Manure Company; at Gowerton, near Swansea. It was described in the "Register of Patents" in the JOURNAL for Feb. 12 last year. The ammonia is liberated from gas liquor in the usual manner, and is passed, together with a current of air, into saturators containing the waste "pickle" from the tin-plate works. This "pickle" is the liquor after the iron plates have been treated with sulphuric acid. Oxide and sulphide of iron are thrown down in the saturator, and the fluid, after filtration, is evaporated for ammonium sulphate crystals. For this method is claimed the advantage of manufacturing sulphate of ammonia from gas liquor and the waste product of tin-plate works, and also an easy manner of obtaining oxide of iron for the manufacture of venetian red. Dr. Fryer also alludes to the "cheap and novel form of saturator" erected by Mr. J. J. Jervis at the New Swindon Gas-Works. This saturator was an object of interest to the members of the South-West of England Association on the occasion of their visit to the works at their spring meeting in March last. It is constructed out of half of a wooden tub (3 ft. 6 in. diameter and 2 ft. 6 in. deep), lined with 15-lb. lead. The dome of the saturator stands within the tub on three cast-lead blocks, and is made of 20-lb. lead. It is 3 ft. 4 in. high, with a diameter of 2 feet; and the foul gases pass away through a 4-inch pipe at the top. This saturator was constructed at a cost of less than £12; and half a ton of sulphate of ammonia can be manufactured in it in 12 hours. Mr. Jervis not only claims for his saturator simplicity of construction, but also great economy in wear and tear.

The southern part of the South of England district is under the supervision of Mr. Brereton Todd. In it there are 36 works making sulphate of ammonia; 24 of them using coke scrubbers for condensing the vapour given off from the saturator, and 8 others using cylinders or cooling-pipes for the same purpose. In two, the sulphuretted hydrogen is burnt into sulphurous acid; one burns it into sulphurous acid, and passes it into the sulphuric acid chambers to form sulphuric acid; and one uses the Claus process for decomposing it, any escape being passed through an oxide purifier. The works vary in size according to the quantity of liquor treated. They are reported as being all in good order but one, which was working with inefficient cooling plant. The eastern counties are formed into a sub-district, under the care of Mr. F. Napier Sutton. It contains 38 works in which sulphate of ammonia is manufactured; the production last year being 31,463 tons—an increase of 1542 tons as compared with 1888. The erection of plant on the continuous system of manufacture has been further extended in this district; and we are told that there are indications that before the next busy season, many more will have discarded the intermittent for the more economical method. The Claus sulphur-recovery process was in use at two works, with satisfactory results. In one works where a continuous plant is used, the oxide in the purifiers is now successfully revivified *in situ*. The method in use for forcing the supply of air into the foul gases is similar to that employed at the Redheugh works of the Newcastle and Gateshead Gas Company. The purifiers now remain active three times longer than before this method was adopted; and much trouble and considerable expense are saved. Mr. Sutton thinks it is to be regretted that this plan is not more generally in use. Having given a detailed account of the alterations and improvements made in the sulphate of ammonia works in his district, the Inspector furnishes some particulars as to the yield of sulphate (containing 24¼ per cent. of ammonia) per ton of coal carbonized at certain works in his district by the continuous and intermittent plants respectively. He thinks these will be interesting, in view of the question frequently put to him by manufacturers as to how their yield of sulphate compares with those of other works. The particulars referred to are as follows:—

CONTINUOUS PROCESS.

	Description of Coal Used.	Yield of Sulphate in Pounds.
No. 1.	Chiefly Ravensworth Pelaw, with one-sixth South Yorkshire Silkstone	25·48
„ 2.	Ravensworth Pelaw, Pelton, Pelton Main, and Waldridge	25·46
„ 3.	Chiefly Newcastle district coal	24·37
„ 4.	Wharncliffe Silkstone	23·00
„ 5.	Chiefly Aldwarke Main, Strafford, Thorncliffe, Barrow, and Dodsworth Collieries, with one-sixth Madeley	22·80
„ 6.	East Pontop (Newcastle)	22·42
„ 7.	Barnsley Silkstone and North Staffordshire	21·47
„ 8.	Hutton and Maudin seams, Bolden Pit Company, Durham	19·50
9.	New Pelton (Newcastle)	18·00
	Average yield	22·50

INTERMITTENT PROCESS.

No. 1.	Chiefly Tawkesley (Thorncliffe), with a small quantity of Wigan	24·00
„ 2.	One-half Pelaw Main, and equal quantities of Aldwarke Main and Normanton	22·00
„ 3.	Equal portions of Ravensworth Pelaw, and South Yorkshire Silkstone	19·00
„ 4.	Equal portions of Aldwarke Main and Pelaw Main	18·95
„ 5.	Equal parts of Orrell (Wigan) and Barrow (Yorks)	18·88
„ 6.	Rockingham Colliery (South Yorkshire)	18·60
„ 7.	Equal portions of Hoyland and Wharncliffe Silkstone	18·50
„ 8.	Madeley and Leycett Collieries	16·84
„ 9.	Equal portions of Staffordshire and Wigan	11·45
„ 10.	Barnsley Silkstone and North Staffordshire	9·72
„ 11.	Warleigh (South Yorkshire) gas coal	6·81
	Average yield	16·79

The concluding portion of the report—that which relates to Scotland—does not need notice at any great length. The quantity of sulphate of ammonia manufactured in this part of Great Britain last year was 39,505 tons, of which 9907 tons came from gas-liquor works, 5645 tons from blast furnace gases, and 23,953 tons from the distillation of shale. In all these cases, the figures show an increase as compared with the preceding year—amounting in all to about 6 per cent. It is satisfactory to find that there was a general freedom from complaint with regard to these works last year; and that the efforts to prevent the escape of sulphuretted hydrogen during the manufacture of sulphate were very successful.

The Vyrnwy Aqueduct in Cheshire.—The water pipe-line of th Liverpool Corporation between Malpas and Tarporley is so far completed that water from the Vyrnwy lake is being sent down to the valve-house at Egerton Green. Here the overflow-pipes have been tested; a quantity of water being allowed to escape into the ordinary watercourses. The erection of the valve-houses practically completes the work on this section in Cheshire. In a few days the water will be allowed to flow down the pipes a further length, to the valve-house at Beeston Moss.

Coventry Corporation Water Supply.—Owing to the increasing shortness of the water supply at Coventry, in comparison with the rapid growth of the population, it has been found necessary to exercise economy. There has customarily been a constant supply in all parts of the town; but it has been deemed expedient to make it intermittent, and the water is now turned off nightly. The reservoir at Radford is, however, kept full, to meet emergencies. Meanwhile the new waterworks are making progress; but though the reservoirs at Coundon are in course of construction, and boring has been successfully conducted at Willenhall, a considerable time must necessarily elapse before the undertaking is completed.

THE INQUIRY INTO THE WATER SUPPLY OF THE CITY OF LONDON.

The Committee appointed by the Corporation of London to inquire into the water supply of the City, and the charges made therefor, whose proceedings so far have been already reported in the JOURNAL (*ante*, p. 1083), met again at the Guildhall on Monday, the 9th inst., under the presidency of Sir GUYER HUNTER, K.C.M.G., M.P.

Mr. *S. Wood*, a member of the firm of Messrs. Alfred Lass and Co., Chartered Accountants, of Gracechurch Street, who had been requested to give evidence, was the only witness called. He said he had had considerable experience in the preparation of statistics for arbitrations and parliamentary proceedings in connection with gas and water undertakings. He handed in a series of tables in reference to the London Water Companies; and was shortly examined by the Chairman thereon. He explained that the first table, giving the capital of the eight Companies, had been prepared from their accounts for the years 1880-1 and 1888-9. Three of the Companies made up their accounts to Dec. 31; and the other five to March 31. The last dates up to which the whole of the Companies' accounts had been issued to the public were December 31, 1888, and March 31, 1889. He could not say how it was that there was not a uniform date for making up the accounts; but they were prepared according to forms settled by the Board of Trade. Proceeding to explain the objects of the tables, witness said the first compared the capitals of the Companies as they stood in 1880 and at the end of 1888 respectively. It gave the total loan and share capital authorized for each of the Companies; the amount of ordinary stock and share capital, with the maximum dividends payable thereon; the amount of preference capital raised; the amount raised in debentures; and, apart from that, the amount raised in debentures subject to the sinking-fund clause, with the premiums paid upon such debentures. It also gave the total amount of premiums received by the Companies irrespective of the ordinary share capital; and likewise showed the share and loan capital remaining to be issued, paid, or called up, the total amount of capital expenditure, the average rate of increase, and the capital in hand or overdrawn for each of the two periods named. The total amount of share and loan capital authorized at the end of December, 1880, or March, 1881, as the case might be, was £14,311,862; in 1888-9, it was £15,383,774—showing an increase of £1,071,912 in eight years. In 1880-1 the amount of ordinary stock and share capital raised was £9,115,119; in 1888-9, it amounted to £10,042,915—an increase of £927,796. The total amount of capital expended at the above-named dates in 1880-1 was £12,612,590; in 1888-9, it was £14,554,813—showing an increase of £1,942,223 in eight years, or at an average rate of 1 81 per cent. per annum. The amount of capital expenditure by each of the Companies at the close of 1888-9 was as follows:—New River, £3,525,000; East London, £2,353,000; Southwark and Vauxhall, £2,123,000; Lambeth, £1,669,000; Grand Junction, £1,513,000; West Middlesex, £1,295,000; Chelsea, £1,197,000; Kent, £880,000. The statement of the Companies' capitals which he had put in had been compiled from the published accounts as passed by the Official Auditor, Mr. Stoneham.

The CHAIRMAN remarked that they had hoped Mr. Stoneham would have been present that day; but he was unfortunately unwell, and therefore they had had to call upon Mr. Wood, who had given them particulars of great importance. As the figures were very intricate, and required a great deal of careful consideration, he thought it would be advisable not to take any further evidence that day, but to ask Mr. Wood to come again on some future occasion. In the meantime, he must thank him for attending, with great inconvenience to himself, at very short notice.

The proceedings were then adjourned.

The inquiry was resumed on Friday, the 13th inst., when, in the absence of Sir Guyer Hunter, Mr. ROSE-INNES presided.

Mr. *Wood* was further examined on the tables he had put in, which, in addition to the figures given above, furnished the following particulars: The income from water-rates in 1880-1 was £1,457,479; in 1888-9, it was £1,746,510—being an increase in the eight years of £289,031, or at an average annual rate of 2·29 per cent. The following was the total amount of water-rental for each year: 1880, £1,457,400; 1881, £1,522,600; 1882, £1,576,200; 1883, £1,625,200; 1884, £1,654,500; 1885, £1,654,000 (in this year there was apparently a check in the rate of progress by nearly all the Companies); 1886, £1,704,100; 1887, £1,735,400; 1888, £1,746,500. The total working expenses in 1880-1 were £552,300; in 1888-9, £647,841—an increase in the eight years of £95,541, or at an average annual rate of 2·02 per cent. The total profit on trading in 1880-1 was £905,179; in 1888-9, £1,098,669—an increase in eight years of £193,490, or at an average annual rate of 2·45 per cent. The average income per house supplied in 1880-1 was £2 9s. 7d.; in 1888-9, it was £2 7s. 3d. The only Company showing an increase in this respect was the Chelsea, who in 1880-1 received £3 3s. 11d. per house, and £3 12s. per house in 1888-9. The total dividends paid on ordinary capital were, in 1880-1, £771,460; in 1888-9, £903,682—an increase in eight years of £132,222, or at an average annual rate of 2 per cent. The average rates of dividend paid on the ordinary share capital by the Companies during the eight years were as follows: Chelsea, £7 13s. 4d. per cent.; East London, £7 3s. 7d.; Grand Junction, £8 6s. 8d.; Kent, £9 12s. 2d. (including back dividends); Lambeth, £7 8s. 10d.; New River, £11 14s.; Southwark and Vauxhall, £6 15s. 3d; and West Middlesex, £10 14s. 3d. (including back dividends), giving a general average of £8 17s. 7d. per cent. According to the report of the Select Committee of 1880, the back dividends claimed by the Companies amounted to about £20,000,000. With regard to the quantity of water supplied, in 1880-1 it was 52,038 million gallons; in 1888-9 it was 59,451 millions—an increase of 7413 million gallons, or at an average annual rate of 1¾ per cent. The total bulk of water sent out by each of the Companies in the year 1888-9 was as follows: East London, 14,595 million gallons; New River, 10,950 millions; Southwark and Vauxhall, 8476 millions; Lambeth, 6245 millions; Grand Junction, 6006 millions; West Middlesex, 5459 millions; Kent, 4296 millions; Chelsea, 3420 millions. The number of houses, &c., supplied in 1880-1 was 601,210; in 1888-9 it was 746,319—an increase of 145,109 houses, or at the average annual rate of 2⅜ per cent. The difference was accounted for by the fact that in 1880-1 the general average quantity of water supplied was 241 gallons per house, or 31¾ gallons per head per day; whereas now it is only 220 gallons per house, or 29½ gallons per head. The supply per head per day by each of the Companies in the year 1888-9 was as follows: Chelsea, 34·22 gallons; Grand Junction, 33·51 gallons; East London, 32·82 gallons; Southwark and Vauxhall, 28·43 gallons; West Middlesex, 28·22 gallons; Lambeth, 27·88 gallons; Kent, 27·65 gallons; New River, 26·50 gallons. The proportion of houses on constant supply has increased at the rate of 12 per cent. per annum in the eight years dealt with. In 1880-1 the average percentage of houses on constant supply was 26·75; in 1888-9 it was 53·37. The proportion of houses served on the constant service in the last-named period by each of the Companies was as follows: East London, 84·73; Grand Junction, 78·03; Kent, 52·73; Lambeth, 50·81; Southwark and Vauxhall, 43·04; New River, 37·18; West Middlesex, 33·58; Chelsea, 18·70. The amount paid by the Companies for rates and taxes in 1880-1 was £90,115; in 1888-9 it was £149,305—an increase of £59,190, or at an average annual rate of 6½ per cent. The amounts paid by each of the Companies in the last-named period were as follows: New River, £45,987; East London, £24,033; West Middlesex, £17,140; Southwark and Vauxhall, £16,489; Grand Junction, £14,880; Lambeth, £14,778; Chelsea, £9105; Kent, £6893. Witness had also prepared a tabular statement setting out the whole of the charges authorized to be made by each of the Companies in pursuance of their respective Acts of Parliament. It gave the rates charged for domestic supply; and for water-closets, baths, and high service (which it defined), and trade purposes; and explained the supplies which are not deemed to come under the head of "domestic." In reference to this statement, he pointed out that, although the majority of the Companies' regulations are alike in some respects, no two are exactly alike. For instance, with regard to six of the Companies, the Chelsea, Grand Junction, New River, and West Middlesex, are authorized to charge at the rate of £4 per cent. per annum on annual values not exceeding £200, and at the rate of £3 per cent. on annual values above £200. The Southwark and Vauxhall and East London Companies' rates are £5 per cent. per annum on all annual values. Five of the Companies just mentioned have one scale of charges for the first water-closet, bath, or high service, and a lower scale for the second, on annual values from £30 to £300. The sixth Company (the East London) has one scale for every single water-closet or fixed bath, on annual values from £30 to £100, with 25 per cent. additional for high service. The definition of high service for five of these Companies is 10 feet above the pavement; for one of the Companies it is 20 feet. Five of the six Companies have a scale of charges for the supply of water by measure; four of such Companies having a minimum quantity of 25,000 gallons. The sixth Company have no such scale. With regard to the remaining two—viz., the Kent and the Lambeth—the Kent Company have a scale of rates for domestic supply, including one water-closet, for each £1 of annual value from £7 to £20, and for each £5 of annual value from £20 to £95, when it reaches £4 per cent. The Company have also separate scales of charges for the second water-closet, for all other water-closets, for the first bath, and for all others; and supplies by meter are made by special agreement. The Lambeth Company's charges range from 7½ per cent. on annual values of £20 to 5 per cent. on annual values of £100; and there are extra charges for the first water-closet and lower rates for all others. Water is supplied for other purposes by agreement. Witness expressed the opinion that the average income per house supplied is not a satisfactory basis of calculation. On this point he said: In 1884 a return was made to Parliament by the Metropolitan Water Companies, on the motion of Mr. Firth. The return included (among other things) the number of houses or other buildings supplied with water by the Metropolitan Companies, and the charges made for water for the year 1872 and the year 1883. This return showed that the increase in the number of houses, &c., during the eleven years was 32 per cent., while the water-rentals had increased to the extent of 58 per cent. From this it might be inferred that a considerable portion of the increase in the receipts of the Companies was due to the raising of their rates. The Companies, however, objected to such an inference. The Lambeth Company issued a statement in which they calculated that, instead of the increase in the charges by revision of rentals being 31 per cent. (as might be inferred from the return), it was less than 5 per cent.; and the Grand Junction Company sent out a statement in which they calculated that the percentage of water-rental on the annual value was really 0·1 per cent. higher in 1872 than in 1883. The number of houses, &c., is, in fact, the number of supplies, and includes any and every building for which water is supplied for domestic and for all other purposes; and the water-rental includes considerable sums for non-domestic and trade purposes. The return did not give the number and rental of the houses pulled down, the houses enlarged or extended, and the new houses supplied. But, in addition to this, the basis of comparison should have been between the water-rates for domestic supply and the annual values upon which such water-rates were levied. A return framed in the following order would probably (with slight improvement) furnish satisfactory evidence as to the amount of the increase in the receipts of the Companies due to the increase of rateable value: (*a*) Rateable value of all houses supplied with water for domestic purposes—*i.e.*, the rateable value on which the charge for water is assessed. (*b*) One year's total charge for water supplied for domestic purposes. (*c*) One year's total extra charges on domestic houses for water-closets, baths, high service, &c. These particulars should be given in respect (1) of the houses supplied in the year ended Dec. 31, 1885; (2) of the houses supplied in the year ended Dec. 31, 1890; (3) of the houses pulled down between Dec. 31, 1885, and Dec. 31, 1890; and (4) of the new houses supplied, or the proportion for extension and enlargements of houses between Dec. 31, 1885, and Dec. 31, 1890. Then, by allowing for the houses pulled down and for the new supplies, a fair comparison can be made between 1885 and 1890. The date of 1885 is suggested because the decision in the case of *Dobbs v. The Grand Junction Water Company* was given in 1883, and the Water

Rate Definition Act was passed in 1885, and the new basis for the Companies' charges was probably settled by that time. In the meantime, the comparisons which have been made are practically all that are available. In regard to the value of the London Water Companies' undertakings, witness stated that, in the Metropolis Water-Works Purchase Bill of 1880, it was proposed to give the shareholders 3½ per cent. stock to the amount of £22,098,700 and deferred stock to the amount of £9,300,000; making a total of £31,398,700. Two or three years since, his firm prepared a statement on behalf of the late Sir Francis Bolton, the Metropolitan Water Examiner, showing the result of the actual working of the London Water Companies, compared with the interest which would have been payable on the 3½ per cent. purchase stock, for the five years from June, 1880, to June, 1885. The net profits, after payment of interest on loan capital, and allowing for interest on additional share capital raised by the Companies since 1880, showed that the purchasing authority would have made a clear gain up to that time of £15,000 in the five years, without taking into account any saving which might accrue from unity of management and consolidation in other respects.

The CHAIRMAN: In other words, on that basis the profits would have been £15,000 in five years.

Witness: It was the actual profit earned by the Companies during that five years.

The CHAIRMAN: Does union tend ultimately to the saving of expense?

Witness: Undoubtedly. The gas undertakings which have been bought up by corporations and local authorities are now enabling those authorities to pay large sums towards the rates.

The CHAIRMAN: Would you have any objection to giving us the names of those fortunate corporations?

Witness said the Ramsgate Corporation was one; and they had contributed a considerable sum in relief of the rates. A further advantage that would accrue from the control of the water undertakings by a public body was that it would be a great convenience if the public could go to one central authority for their supply of water to warehouses and shops. With regard to the market value of the Companies' undertakings, the Stock and Share Department of the Stock Exchange would be the most reliable authority from whom to obtain information.

The CHAIRMAN: Would you mind taking this assumption? Supposing you yourself had a house in the best part of the West-end of London at a rental of £2000 per annum, and there were as many water-closets in it as would be calculated to a house at £50 a year in the Whitechapel Road, what would you have to pay for the water supply to the house with the large rateable value?

Witness said he would prepare the answer to the question, as well as other information relating to the supply of water to closets.

Alderman *Cowan* was the next witness. He stated that he had had considerable experience in the raising of water, and its supply to houses on the basis of rateable value, as well as in the supply of water by meter. He had always considered that water should be paid for according to the quantity used, just the same as any other article of consumption. In consequence of a fire which occurred at his premises, he had been obliged to take a temporary place of business where he was supplied with water by meter by the East London Water Company, who charged at the rate of 6d. per 1000 gallons. The rateable value of his premises was from £400 to £500 a year. He did not ask for a supply by meter, and he had never been so supplied before; but he knew it was the custom of all water companies, when very large quantities of water were taken, to sell by measure. In consequence of being served for the first time in this way, he made special observations, and in a very short time the indicator of the meter warned him that certain safeguards could be introduced to diminish the cost; and these, of course, he very speedily adopted.

The CHAIRMAN inquired if witness had come to the conclusion that water should be supplied by a public body and not by private companies, which existed necessarily with the idea of paying good dividends.

Witness replied that he had not given special attention to it; but as a matter of fact and of common sense, it appeared to him that it would be better if a public body, irrespective of commercial gain, were to supply the water.

The CHAIRMAN: The question of the mode of charge, whatsoever it may be, should be fairly discussed in the interests of the public generally.

Witness: That is my view; and it bears particularly upon the observations I have made.

In reply to Mr. HORA, witness said the Water Companies had the power to compel the supply of water to be taken by meter for business purposes; and they had the option of doing so for domestic uses. That did not appear to him to be right. He should not like to go so far as to say, after considering the matter, that it was absolutely necessary for the benefit of the public health and cleanliness, that the supply of water should not remain any longer in the hands of companies trading for profit, and should be put in the hands of a public authority as there were a great many articles necessary for health and cleanliness supplied by private enterprise. He could not, however, compare anything with water; and he thought that, like Manchester, Birmingham, and other places, it would be a very good thing indeed if the supply for the Metropolis were placed in the hands of some public body, and whatever profits resulted applied in reducing the rates. So far, his evidence had not been confined strictly and literally to his own personal experience. He should like to go a little further, and say that, although this had been with meters that in his judgment were not accurate, he believed meters were made which were correct. There were meters which would give the public a very fair opportunity of obtaining approximately, if not literally, a fair register of the quantity of water used, so that there might be no chance of overcharge. The meters themselves and the method of their application, their periodical examination, and their control, should be entirely under the supervision of a body—whether a water authority or the authorities now in existence was immaterial—entirely independent of the companies. He thought if this were adopted, the public would have every reason to be satisfied with the supply of water by meter. In the case of the poorer classes, it was obvious that a person living in a house and using the water only for domestic purposes, should pay less than a neighbour who was a laundress.

Mr. *H. Clarke*, a present member of the Common and County Councils, said the Corporation in their present action had not merely in view the benefit of consumers in the City, but of the whole of the Metropolis as well. When about five years ago the question of the water supply of the Metropolis was before the Gas and Water Committee of the Corporation (of which the present County Purposes Committee was the successor), a resolution was passed to the effect that the only satisfactory remedy for the defects which they found in the system of charging, was for the whole of the water supply of the Metropolis to be placed in the hands of a public body, and administered exclusively for the public benefit. At the time of the reference to the Gas and Water Committee, he prepared a statement showing the diversity of the Companies' charges; and this he handed in. It would be seen that some of the Companies charged less than half what was charged by the others, if they estimated the total value of the water delivered and the total receipts of the respective Companies, and divided one by the other. The occupier of a house on the confines of the boundary of one Company might pay considerably less, or more, than the occupier of the house a few yards off supplied by another Company; and it was manifest, therefore, that the public must be sufferers by the higher charges. This was undoubtedly a very great inconvenience to the owners of property in different districts. Speaking as a local administrator, he had no doubt that a central authority would be able to manage the water business greatly to the advantage of the inhabitants of the Metropolis. One of the documents he produced related to certain buildings in the City taken hap-hazard. It gave the rates paid before 1869 and in 1884, and showed an increase. There were a great many inequalities in the charges of the New River Company. In one case there was a gross estimated rental of £4000, and the amount of the water-rate was £72 12s. In another, the premises were of the same gross estimated rental; but the water-rate was only £33 15s., or less than half. At the time the statement was prepared, an endeavour was made to ascertain the cause of these inequalities; but no satisfactory solution was arrived at. There were a large number of buildings in the City of enormous rateable value as compared with twenty or thirty years ago, mostly let out as offices, with no residential accommodation. The only water used there would be for lavatory and cleansing purposes. The New River Company did not force meters on occupiers of premises; on the contrary, they assessed the premises, and then made the occupiers pay greatly in excess of the value of the water supply. The place was let out to various tenants; and, in effect, the tenant paid the water-rate. It amounted to this: A man might have a suburban residence for his family, and have business premises in the City as well; and it was manifest that the only additional water that could be used by him in London away from his dwelling must be that used for cleansing the premises. But he was made to pay the water-rate not only for his dwelling, but also for his City place. Not only that, he had to pay considerably more in the City, where the consumption of water would be trifling as compared with that at his residence. Anyone having his dwelling in the suburbs and business premises in the City, paid not only the rate on the initial value of the premises, but every five years he was compelled to pay considerably more. He thought a minimum charge for each house was the only practical way of adjusting the water-rental fairly, whoever had the supply.

By Mr. HORA: He believed that in every case where the municipal authority had acquired control of the water supply, the citizens had been greatly benefited. He was aware that Mr. Hora had in 1870 brought forward a resolution in the Court of Common Council advocating the taking over of the water supply by the Corporation; but the proposal was rejected. He believed it was a calamity to the citizens of London that the resolution was not acted upon, as it involved the loss of several millions of money. Even now, although the conditions had changed, it would be a great advantage to the community if the London Water Companies' undertakings were bought up. The most iniquitous thing about the Companies was that, without any reference to the quantity of water supplied, but simply owing to the advance in the rateable value of the property at the quinquennial re-valuation, they increased their charges. The New River Company at the time the City supply was turned over to them in 1822, agreed not to increase their charges to the premises then receiving water. This compact was, however, utterly disregarded in 1852, when the Company taxed the whole of the houses throughout the City on the basis of the estimated rental value. So recently as 1850, the Company admitted the compact they made in 1821, not to increase their charges more than 25 per cent. over those of 1810. From the investigations which four years ago he was called upon to make, he came to the conclusion that the Water Companies of London had not fulfilled their trust to the public, which was to give them a plentiful service of pure water at a fair price. He therefore thought the Companies could not complain if the water supply were taken from them—of course, on equitable terms for no one in these days talked about confiscation—and administered to the exclusive advantage of the ratepayers of the Metropolis.

The inquiry was then adjourned till yesterday.

Farlam Water Supply.—Major-General Phipps Carey, one of the Inspectors of the Local Government Board, has held an inquiry relative to an application by the Sanitary Authority of the Rural Sanitary District of the Brampton Union for sanction to borrow £2956 for works of water supply for the parish of Farlam. There was practically no opposition.

Lighting of Swansea Harbour by Electricity.—The installation for lighting by means of electricity the whole of the Swansea Harbour has now been completed. The previous experimental installation simply comprised the Prince of Wales Dock and the Pier. The work has been carried out by Mr. Polybank, Assistant-Engineer to the Trust. A large engine-house has been erected; and in it a 250 to 300 horse power engine has been placed. In the docks there are fixed twenty-five 300-candle power "Sunbeam" lamps; and in the offices, workshops, &c., ten or twelve 500-candle power lamps.

LONDON VESTRYMEN AND THE WATER SUPPLY OF THE METROPOLIS.

Important Conference.

A Conference of Delegates from Metropolitan Vesteries, on the question of the London Water Supply, was held at the Vestry Hall, Piccadilly, last Thursday. The Conference was convoked by the St. James's Vestry; and nearly all the Vestries were represented. For the information of the delegates, in the early part of this month reports were circulated among them which had been prepared by the Sanitary and Parliamentary Bills Committee "as to the best means of conferring on London the control of its own water supply." Mr. J. BONTHRON, of the St. James's Vestry, was voted to the chair.

The CHAIRMAN, in his introductory remarks, said that the subject they had met to discuss was a very important one; and he could not do better than inform the delegates of the steps that had been recently taken by the St. James's Vestry in the matter. The question was urged upon them by the quinquennial valuation; and all the difficulties that would arise in the probable—he might almost say inevitable—increased assessment of the Metropolis, and the consequent power of the Water Companies to make their charge on that, without any corresponding advantages to the consumers, had all been carefully considered by them. The Vestry addressed a petition to the House of Commons on this matter; and the subject had been introduced to the notice of the Government by Mr. J. Kelly in the form of a question to Mr. Ritchie. The right honourable gentleman's reply was: "The powers to which my honourable friend refers are powers conferred by statute on the Water Companies, and cannot, I think, be dealt with alone. The matter is one which should be considered in connection with the whole question of water supply. I need hardly say we can hold out no hope of dealing with so difficult a question during the present session." The Vestry next turned their attention to the idea incipiently shadowed forth in Mr. Ritchie's answer—viz., whether the water supply of the Metropolis should not be a municipal concern. They had come to the conclusion that London should govern its own supply; and the evidence which they had gathered showed the immense advantage which would result from the unification of the Companies.

Mr. JAMES BEAL then moved the first resolution—"That this meeting of delegates from the Vestries and District Boards of the Metropolis affirm the necessity of the water supply of London being placed in the hands of a municipal body representative of London." He said that he did not think the principle of this resolution would be contested—that it was right the people of London should have control of their own water supply. This had been affirmed in repeated parliamentary contests; and in the second session of 1880, a Parliamentary Committee expressed the opinion that the Government should take up the matter. As a member of the London County Council, he had proposed that the water supply should be placed in the hands of that body, and they introduced a clause in a Bill with this object in view; but it met with the opposition of some young members of Parliament. The same clause had been inserted in a Bill this year; but, up to the present time, it had not come before the Committee to which it was referred. Therefore he had suggested to the St. James's Vestry that, as they had more powers in connection with these questions than the County Council, the Vestries should come to the help of London; and then the Council could step in and take up the matter where the Vestries left it.

Sir W. J. FARRER (St. George's, Hanover Square, Vestry), in seconding the resolution, said he apprehended that the delegates were all agreed upon the principle contained therein. They would, of course, have to work through the County Council.

Mr. J. W. WHITER (Hackney Vestry) said he imagined the mover of the resolution desired that they should affirm the necessity of the water supply of London being in the hands of some authority. He did not think he wished them to bind themselves to accept the London County Council as being the medium through which the inhabitants should receive their water. He hoped they would express an opinion that some other body should control the supply.

Mr. HENNESSY (St. George the Martyr Vestry Southwark) pointed out that the Government would, by the resolution, have the option of establishing a new authority; and possibly, in their antagonism to the views of the County Council, they might be induced to do so. He moved, as an amendment, that the words "County Council" be inserted in place of "a municipal body representative of London."

Mr. J. MAY (Islington Vestry) said that it was impossible to conceive that the Government would promote a body to merely deal with the water supply. Personally, he should like to see the County Council as the controlling authority; and therefore he would second the amendment.

It having been ruled by the Chairman that the question raised by the amendment had more application to the second than the first resolution, the latter was unanimously carried.

After some discussion on the question of procedure,

Mr. C. STONE (St. Margaret's Vestry, Westminster) moved, as a preliminary to resolution No. 2—"That, as a preparatory step towards giving effect to the principle affirmed by the foregoing resolution, it is in the opinion of this conference imperatively necessary to restrain the Water Companies from increasing their charges upon the basis of the quinquennial valuation now in progress; and that this conference therefore request the President of the Local Government Board to receive them as a deputation to (*a*) request him to reconsider the decision communicated to the House of Commons in reply to questions on March 13, and May 19; (*b*) to submit the necessity for the introduction of a Bill by Her Majesty's Government to suspend the exercise of the powers conferred upon the Companies by the Act of 1847 and subsequent Acts as to the basis of their charges; and (*c*) failing the introduction of a Bill by the Government, to suggest that facilities may be afforded for the consideration of the Bill introduced by Mr. Causton, and now awaiting second reading." He said that his main object in proposing this resolution was because there was no provision in those which had been formulated for discussion by the meeting, for the suspension of the powers of the Water Companies after the re-assessment of property had taken place.

Mr. BOLTON (North St. Pancras Vestry) agreed that they should first discuss the question of the increase in the charges of the Companies consequent upon the quinquennial valuation. This was a more pressing matter than that of the transference of the water supply into the hands of a representative authority, which involved much larger considerations. This question of the increased charges might very well form the subject for a deputation to a member of the Government; and a Bill might then be promoted, or support given to that introduced by Mr. Causton. He was inclined to think that the larger question of the water supply would be a very difficult one to deal with in the present session of Parliament.

Mr. STONE said it was because he thought his resolution was likely to accomplish a practical result, that he proposed it. They should go to the Government in the interests of the ratepayers, and inform them that it was their duty to save the latter from what he conceived to be a "legalized form of robbery," seeing that the Water Companies would have the power to charge them an additional sum of money without giving one farthing's work of extra benefit in return. It was not only a question of the imposition of further taxation upon the ratepayers, but if they did not move in the matter, their inaction would allow a further two millions of money to accrue to the Companies, which would be an additional obstacle in the way of the acquisition of their property. By his resolution, he wished to assist the one which was to follow. Because he desired that the water supply should be in the hands of a representative body for the good and profit of the ratepayers, he was anxious to stop at once any further "unearned increment" falling to the Water Companies. He hoped his resolution would be adopted, and placed at the earliest possible moment before the Government (who, he asserted, had declared themselves hostile to the ratepayers of London in this matter), demanding from them that they should protect the water comsumers from any further increased charges.

Mr. F. W. SOUTTER (Bermondsey Vestry) seconded the resolution; remarking that the time had come when the Water Companies should not be permitted to raise their rates simply because the value of the property in the Metropolis had risen through the labour of the ratepayers.

Mr. J. LIDIARD (Wandsworth District Board) said it seemed to him to be scarcely possible that they had any chance of getting this proposal carried. They were on the point of attempting the purchase of the Water Companies' property; but, before doing so, they were suggesting taking an act of their own, without consulting the Companies, with a view to damaging the value of that which it was desired to buy. He submitted that this was not just. It was unfair to attempt to destroy the value of that which they wanted to acquire. The Water Companies had been induced to expend large sums of money in the Metropolis for the benefit of the Metropolis; and they had spent this upon the faith of certain parliamentry enactments which enabled them to charge according to the rateable value. Therefore, the Companies ought to be dealt with in a fair and just way, the same as they would treat a private individual.

Mr. HENNESSY supported the resolution, observing that it ought to be given effect to as early as possible. The Companies were privileged to supply water; but from some mischance, no precautions were taken in drafting the Act under which they levied their rates, to prevent them making additional charges on the ratepayers. Therefore, because some one neglected to do a certain thing, the later had to pay damages to the Companies.

Mr. J. LENANTON (Poplar Vestry) also thought that no time should be lost in putting a stop to the "wholesale legalized robbery" on the part of the Water Companies. He was surprised to hear the remarks of Mr. Lidiard. If he had been sent there as a delegate in the interests of the Water Companies, he could not have spoken stronger in their favour.

Sir W. J. FARRER remarked that in times past no one had felt more strongly than he the great injustice of the present system of assessing water-rates; but if he were asked to join a deputation to a Minister to ask him to introduce a short Bill, he should consider how to carry it out. If he went to a Minister with a short Bill, the Minister would say: "Well, do you consider that other parties are interested as well as yourself. I, as a Minister, have to consider the interests of all parties; and I find that a Bill was passed in the year 1847 which entitled the Companies to charge according to annual value. But not only that, when discussion arose as to what annual value was in 1885, another Bill was passed which emphasizes the claims of the Water Companies, by declaring that they shall still charge upon annual value, but the annual value shall be assessed according to the rateable value." Large houses in London have been raised, until now the rateable value was nearly approximate to the full annual value; and the Water Companies claimed to assess their rates upon that increased annual value. The Minister would say: "I am met by one Act and then another; and the second was passed with the consent of the people of London. If I introduce a Bill, I must give the Companies an opportunity of stating their case." Then there would have to be a Committee of Inquiry, which would take a very long time; and it would be impossible to get a short Bill passed this session. The Minister would also probably ask the deputation what authority they had; and would perhaps refer them to the County Council as being the representative body of the ratepayers. When t Water-Works Clauses Bill was before the Parliamentary Committee in 1847, Counsel for the Companies stated that the Water Companies did not wish to increase their income beyond the income they were then deriving. But events showed that they had increased their rating according to the increased assessment of the Metropolis; and at the present moment the water consumers were groaning under that heavy rating. Although he agreed in principle with the resolution before them, he did not think it would result in any good effect; they would, in his opinion, only get an additional "slap in the face."

The resolution was then put, when 35 votes were recorded in favour and 4 against.

Mr. BEAL then moved resolution No. 2—"That the Government be

requested, in compliance with the foregoing resolutions, and in view of the loss of the ratepayers by the quinquennial valuation now in progress, permitting an increase of charge to the consumers without an equivalent expenditure of capital, to forthwith introduce a Bill to enable the London County Council to acquire the undertakings of the eight Water Companies now supplying London, or some of them, by agreement, or failing agreement to create a Board of Arbitrators to settle the terms of transfer by compulsory powers, or, failing both, to give powers to establish an independent supply." Mr. Beal, in support of his motion, said they had no wish to confiscate the property of the Companies. This question of the water supply of the Metropolis had been before the public for upwards of 80 years. In 1810, 1820, 1840, and 1852, it was brought prominently forward; the Blue-books being more numerous than those for the Parnell Commission. In 1880 they had Mr. Cross's effort to settle the question; and then there was the Bill of 1885, which was passed at half-past two in the morning with a small House. The question had never been properly presented by a great authority speaking in the name of London. The County Council, however, had tried it; and the present meeting of delegates had been summoned for the purpose of raising the matter definitely and for the last time. The resolution suggested two or three lines of action. They had the right to introduce a competing water supply; and they might co-operate with the Companies, and agree upon terms of purchase, which would be subject to the sanction of Parliament. If the Companies would not help them, then they could put the competing supply in the front rank For 15 millions sterling, they could introduce a competing supply; while they were prepared to pay the Companies a larger sum than this for their works. There was also another line open—they could secure a supply from the existing Companies by meter; and he desired, by means of the resolution, to put the Government in this position—that, failing agreement, the people of London were so anxious to be fair that they were willing to have a Board of Arbitrators elected, who should definitely settle the terms of purchase. It might be interesting to know that in 1879 the rating of the Metropolis stood at £24,000,000; in the following quinquennial year, the figure rose to £27,506,000; and in the next one, to £30,488,000. He did not say there was not a small increase of capital; but the total was under 15 millions. If the quinquennial valuation rose this year, the total increase of 1881, 1886, and 1890 would be about 8 millions; and on this excess the Water Companies were entitled to 5 per cent., or £400,000 a year, which the ratepayers would have to buy at 30 years' purchase—making 12 millions sterling. In his concluding remarks, he urged the ratepayers not to be so quiescent and lukewarm as to allow this matter to slide now.

Mr. MAY seconded the resolution.

Two amendments were proposed to the resolution; and, after some discussion, it was agreed to pass it in the following form: "That in view of the fact that the effect of the quinquennial valuation of the Metropolis now in progress will be to augment the charge to consumers for the same supply of water as is enjoyed by them at the present time, and thereby to increase by a very large sum the value of the property of the Water Companies, the Government be requested forthwith to introduce a Bill to enable the London County Council, or some other properly representative body, to acquire the undertakings of the eight Water Companies now supplying London, or some of them, by agreement, or, failing agreement, to create a Board of Arbitrators to settle the terms of transfer by compulsory powers, or give powers to establish an independent supply."

Mr. J. H. BRASS (Chelsea Vestry) proposed a further amendment, to the effect that all words after "County Council" be struck out, and that the words "to establish an independent supply be added." He believed that if the County Council had powers to establish a supply of water irrespective of the Water Companies, it would be much better for the ratepayers.

Mr. G. W. IRONS (Chelsea Vestry), in seconding the amendment, said he thought it was the weakest possible position for a purchaser to be in, to know that the thing he required only existed in the hands of the seller, and that he had nothing to replace it with. The Water Companies were rapidly appreciating the value of their property; and the ratepayers were at their mercy. They should remember that the basis of Mr. E. J. Smith's negotiations with the Companies in 1880 was upon the annual value; and the net annual value reduced it by one-sixth. Mr. Beal had just read figures which showed that the annual value had increased by more than one-sixth; and they would not now get the Companies to agree to any price like 33 millions, which the payments provisionally agreed upon by Mr. Smith with the Companies, when capitalized, were equivalent to. They would, he contended, have to give additional powers to the County Council, and then let the Companies come to them, and make terms.

The amendment on being put to the vote was negatived.

Resolutions were then passed (1) requesting the President of the Local Government Board to receive a deputation from the Local Authorities of London in support of the resolutions passed; (2) desiring Mr. Beal to state the views of the deputation at the proposed interview; (3) asking Mr. O. V. Morgan and Mr. Bolton to introduce the deputation; (4) instructing the Vestry Clerk of St. James (Mr. H. Wilkins) to bring the resolutions before the Committee of Inquiry now sitting at the Guildhall.

The Cambridge Town Council and Electric Lighting.—The Cambridge Town Council have appointed Dr. Fleming to advise them on the best mode of procedure in carrying out the electric lighting of the town. Assuming an initial outlay of some £15,000 is in contemplation for the establishment of a station of approximately 3000 16-candle power incandescent lamps and 60 1200-candle power arcs, Dr. Fleming has undertaken the work of Consulting Electrical Engineer for a sum of £210; this fee to include all the advice needful up to the time of the acceptance of the tenders necessary for the plant for the station. For visits of inspection during the progress of the work, testing, and reports, he is to be remunerated at the rate of £7 7s. per diem, travelling expenses not included; and for consultations and advice on the extension of the work beyond the above limits, at the rate of 2½ per cent. on the proposed additional outlay.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of May.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 179,880,869 gallons; being at the rate of 30·3 gallons per head of the population, as compared with 28·7 gallons in May, 1889. Of the entire bulk of water sent out, 90,013,013 gallons were drawn from the Thames, and 89,867,856 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was: Kent, 0·6; New River, 0·7 East London and Tottenham, 1·1; Colne Valley, 1·5; Grand Junction, 1·9; West Middlesex, 2·2; Southwark, 2·6; Lambeth, 2·7; and Chelsea, 3·1. [By a printer's error, the proportional amount of organic impurity in the April sample of the Chelsea Company's water was stated by Dr. Frankland as 3·3, instead of 2·3.] The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was, in every case, efficiently filtered, and had a degree of freedom from organic matter nearly equal to that of the high-class samples examined in April. The water obtained chiefly from the River Lea by the New River and East London Companies was also efficiently filtered, and was, in both cases, of a high degree of organic purity. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of a high degree of organic purity. All these waters were clear and bright without filtration."

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner (General A. de Courcy Scott), on the quality of the daily samples of water supplied in London during May, say:—"The variations in the mean composition of the water supplied to London, noticeable from month to month, continue to be, as is usually the case, confined within so limited a range as to afford very little occasion for remark or comparison. During the past month the maximum proportion of organic carbon present in any single sample of Thames-derived water examined was found to be 0·173 part in 100,000 parts of the water, corresponding to about only 0·3 grain of organic matter per gallon. The mean proportion of organic carbon present in the May supply was found to be 0·156 part in 100,000 parts of the water, as against a mean of 0·148 part in the April, and of 0·154 part in the March supply."

STOCKTON AND MIDDLESBROUGH WATER BOARD.

Half-Yearly Report.

At the last Monthly Meeting of the Stockton and Middlesbrough Water Board the report on the operations of the half year ending February 14 last, to be presented to the Corporations of Stockton and Middlesbrough and the Local Board of South Stockton, was approved. The report stated that the capital expenditure for the half year had been £35,216, bringing up the total cost of the undertaking to £1,342,487. Of the capital expenditure during the six months, the principal items were as follows: On account of the Hury reservoir, £16,105; Blackton reservoir, £7608; Sadberge reservoir, £1287; conduit No. 5 (Sadberge to Middlesbrough), £2212; and sundry extensions of mains, £5704. The sums received on capital account in the half year amounted to £54,000; bringing the total amount up to £1,357,804—being £15,316 in excess of the amount expended. The revenue account showed that the income had amounted to £30,897; being an increase of £1051 as compared with the preceding half year, and of £2140 in comparison with the corresponding six months. The expenditure on revenue account was £6925; being an increase of £409 as compared with the preceding half year, and of £44 as compared with the six months ending February 14 last year. The balance carried to net revenue account was £23,972, as against £23,331 in the previous half year, and £21,876 in the corresponding six months. After debiting the net revenue account with sundry small items, there remained a balance of £31,738, including £5973 brought forward from the previous half year. A sum of £24,800 had been paid to the Corporations and the Local Board, leaving the sum of £6938 to be carried forward. It was also stated that during the half year the works in connection with the Hury and Blackton reservoirs have made great progress; and a contract had been entered into for the pipes required to deliver the Balder water into the Sadberge reservoir. The Bill which the Board was authorized to promote in Parliament has passed through its various stages in the House of Lords. Satisfactory arrangements were entered into with the Board of Trade, the Tees Salmon Fishery Board, the Darlington Corporation, and other bodies, which prevented any opposition being offered to the measure.

Stainland Water Supply.—In accordance with the expressed desire of the Local Government Board, the Stainland Local Board recently made an application for the consent of the Huddersfield Corporation to their new water scheme. The Water Committee of the Corporation last Friday week granted their consent, subject to a clause being inserted in the scheme protecting Huddersfield. The terms are precisely the same as those the Corporation laid down when the Board made a previous application.

Serious State of the Northwich Water Supply.—By the operations of salt-boring works at Northwich, the Wade Brook has become seriously polluted. This is one of the sources from which water is obtained for the supply of the town; and it has been found necessary to abandon it, as the water is unfit even for trade purposes. The district is wholly dependent on the Castle and Cote Brook works; and unless immediate steps are taken to augment the quantity of water available, the inhabitants will have to be put on a short daily supply

THE BRADFORD CORPORATION WATER BILL.

Opposition of the Knaresborough Local Board.

Having determined to continue their opposition to the Water Bill of the Bradford Corporation, the Knaresborough Local Board have had a petition prepared, for presentation to the House of Commons. Many of the clauses inserted in the petition to the House of Lords have been re-adopted in the present one; the principal ground of contention being that, by the abstraction of the purest and best waters at the head of the Nidd, the quality of the water supplied will be greatly impaired, and the storeage of flood and other surplus waters will not compensate for such abstraction. On the question of quantity little is said, as the Board were successful in obtaining several important contested amendments when the matter was before the House of Lords. The new clauses introduced deal with the "Manchester clause"—a clause inserted in the Manchester Water Act, 1879, when that Corporation obtained powers over Lake Thirlmere, and which allowed townships requiring the same a right to obtain a supply of water from the conduit from Thirlmere to Manchester on certain terms named in the Act. It will be remembered the Committee of the House of Lords ordered this clause to be applied to Knaresborough; but as that town was many miles distant from the line of conduit from the Nidd to Bradford, it became a serious question as to who should construct the pipe connecting the Knaresborough supply with the Bradford conduit. The main object of the present opposition is to obtain the inclusion of the expenditure in the total capital cost of the Bradford works; Knaresborough paying a percentage thereon in proportion to the quantity of water taken. The petition also supports the contention of the West Riding County Council (who have petitioned against the Bill) for the supply of water from the compensation reservoir to be continuous, and not intermittent as provided by the Blil.

Proposed New Water Supply for Plympton.—The Plympton Rural Sanitary Authority are contemplating the construction of works for obtaining a supply of water for the district from the Bootle Hill Springs. The scheme, it is estimated, will cost about £5000.

The Proposed Purchase of the Andover Water-Works by the Corporation.—The Secretary of the Andover Water Company (Mr. T. Lamb) has addressed a letter to the Town Clerk, stating that his Directors are disposed to accept £6500 for the purchase of the water-works; this sum to include all compensation to officers, &c., but subject to the payment of the existing mortgage debentures for £3000, and interest at 4½ per cent. thereon. The Directors wish the transfer to be completed by Sept. 29 next. This offer is made subject to confirmation by special resolution of the shareholders; and the Directors request a definite acceptance or refusal of the offer on or before the 10th prox. A resolution was passed, at the last monthly meeting of the Council, in which the members expressed their opinion that it was desirable to purchase the undertaking.

Burnley Corporation Gas-Works.—The chief officials of the Burnley Corporation have just issued reports on the progress made in their respective departments during the past twelve months. The Gas Engineer (Mr. J. P. Leather) says the make of gas shows an increase of 29,748,000 cubic feet, or 9·22 per cent., on the previous year, in which the increase was only 3·83 per cent. on the preceding twelve months. The largest consumption in one day was 2,382,000 cubic feet; and the year's work resulted in a greater amount of profit than was estimated. The receipts from gas and coke sold have exceeded the estimates by more than £1300; against which about £1000 has been paid for coal in excess of the estimate. The prospective increase in gas was put down at 5 per cent., but it was 9 per cent.

Sales of Shares.—At the Auction Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold by auction 1250 new shares in the *West Ham Gas Company*; being the first portion of the new capital to be raised under the West Ham Gas Act, 1889. The shares sold at the following prices: 30 at £15 12s. 6d., 50 at £15 2s. 6d., 30 at £15, 110 at £14 15s., 50 at £14 10s., 20 at £14 7s. 6d., 50 at £14 5s., 10 at £14 2s. 6d., 210 at £14, 260 at £13 17s. 6d., and 430 at £13 15s.——Last week, 30 fully-paid £5 shares in the *Golborne Gas Company* were sold by auction; realizing from £6 15s. to £6 17s., per share.——Messrs. Nicholson, Greaves, Barber, and Hastings offered for sale last Tuesday a quantity of stock in the *Sheffield United Gas Company* belonging to the estate of the late Mr. John Rowbotham. The prices realized were: £1000 of class "A" stock sold at £230 per cent.; and £925 of the same class sold at £229½ per cent. £900 of class "B" stock sold at £228 per cent.; £400 at £227 per cent.; and £958 at £224 per cent. £2000 of class "C" stock sold at £223 per cent.; £500 at £222 per cent.; and £370 at £222 per cent. The total amount produced by the sale was £15,920.——At a sale of shares at Leeds last Wednesday, the *Scarborough Gas Company's* 7 per cent. stock, changed hands at £155 per cent.; and *Cross Gates Gas Company's* £10 shares were disposed of for £7 6s. each. Five "B" shares in the *Clayton, Allerton, and Thornton Gas Company* sold for £15 each.

The Northern Coal Trade.—The coal trade of the North is a little disorganized by the great holiday of this district (the race holiday); but the market is strong, on the whole. For best Northumbrian steam coals the demand is still good, and the price is maintained at 13s. free on board; but second qualities are a little easier at from 11s. 6d. to 12s. For small steam the demand is a trifle lower, and 7s. 6d. is a fairly current quotation. Gas coal still sells freely; and for the best classes about 12s. 6d. free on board is the price asked, though rather less is taken for contracts in some cases. One such contract for a Durham town, for about 26,000 tons, has been placed during the last few days. It is said to have been divided among three collieries; the price being stated as from 10s. 6d. to 11s. 6d. at the gas-works, which cannot, however, be very far distant. The delivery is over a year from the end of this month. For manufacturing coals the demand is good, and prices are maintained; but there is a little slackness in the requirements of some of the Tyne shipbuilding yards. House coals are dull in price, and very slow of sale; and bunker coals have also fallen. In coke there is rather more inquiry for best kinds for shipment; but the price is dull—best Durham blast-furnace coke, free on board, being only 19s. to £1. Gas coke is firm.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

As occurred last year, an indiscreet member of the Edinburgh and Leith Gas Commission has communicated to the *Scotsman* an early account of the financial result of the year's business of the Commission. Last year the published statement was made up by a member who held the Treasurer's report in his hand; and it was accurate. This year the statement was made up from other data, presumably by a person not on the spot, and certainly without the Treasurer's report, which has not yet been issued; and it is inaccurate. As your representative here, I have been inquiring after the accounts; and my information is that it is still too early to communicate them to the public. Mr. Gibb, the Treasurer, guards the accounts with jealous care until he lays them before the Finance Committee; and he does not submit them to the Committee till he receives the approval to them of the Auditor. I have learnt that his account was not ready for the Auditor when the statement appeared; and although they have since been made up and the Auditor has got hold of them, it is beyond my power to get at them; and I must confess myself beaten this week in my endeavour to get an authentic report. The unauthorized and inaccurate report was to the effect that the profit on the working in the second year of the undertaking amounted to no less than £40,000; that this was regarded as highly satisfactory, especially in view of the abolition of the charge for meters, which yielded a revenue of about £8000, and of the rise in the price of coal, which represented an increase in the expenditure of about £30,000; that a gain of £3000 is expected to be realized on the price of residual products; and that owing to the increase in the various contracts, it is very probable that an increase of 2d. or 3d. per 1000 cubic feet may have to be made in the price of gas. The statement contains within itself evidence of looseness in construction. For instance, meter-rents in the year to May 15, 1889, yielded only £6526, and not "about £8000;" also it is not correct to say that there was an increased cost for coal to the amount of about £30,000. The rise in the price of coal took place in May last, and affects not last year, but the current one. As a matter of fact, Bailie Archibald last July complimented the Commissioners on their securing contracts for coal at an average of 1s. less per ton for the year ending May 15, 1890, than the price they paid the previous year. To go further into this business would be but whipping a dead horse; only it is necessary, in warning such of your readers as may have seen the statement in the *Scotsman* not to accept it, to give some reasons for my doing so. That there has been an augmented sale of gas I am able to affirm, and also that there will be a handsome surplus; but the correct figures can only be made public when they have been laid before the Finance Committee, which they are not yet in a position to be.

The Dundee Gas Commission had before them on Wednesday the accounts for the year, a summary of which I gave in my Notes on the 3rd inst. Their approval was moved by Mr. James Logie, in room of Treasurer Nicoll, who, as last year, was unable to be present. In presenting the accounts, Mr. Logie said their revenue of £75,415 18s. 6d. exceeded the estimate of £72,674 15s. 6d. mainly on account of the consumption of gas being much greater than was estimated. Chemical products also produced a greater revenue than was expected; but that from coke and the rental of gas-stoves was somewhat less than the estimate. Unaccounted-for gas was less last year than it ever was before; being only 6·787 per cent., as against an estimate of 8·5 per cent. The increased expenditure was accounted for by the cost of coal over estimate, amounting to £591 2s. 6d.; an excess of expenditure upon repairs amounting to £973 4s. 3d., and an increased charge for interest, amounting to £1457. The result of the whole was that they began the year with a debit balance of £86 6s. 11d., and ended it with a debit balance of £73 15s. 1d. Their expenditure on capital account to date had been £185,347, against which they had mortgages and bonds in the hands of the public of the value of £144,857; and the balance of capital expenditure had been disposed of as follows: Mortgages redeemed, £6650; loans redeemed, £10,000; paid by bank overdraft, £23,840; total, £40,490. Mr. Logie would prefer to see the whole capital expenditure placed on debenture or mortgage, and then they could use their sinking fund for its redemption as occasion arose. Last month £20,000 of their sinking fund of £36,017 was employed in paying off mortgages, and a further sum in the redeeming of annuities; and they had gone as far in that direction as he thought they should go until they obtained further borrowing powers. The quantity of coal carbonized last year was 41,031 tons 8 cwt., costing £37,594 5s. 11d. The estimates for the year now current were based on a probable increase in the consumption of gas over last year of 10 million cubic feet; so that they proposed to make provision for carbonizing 42,157 tons of coal, as against 41,031 tons last year. The cost of these 42,157 tons would be £44,264 17s.; whereas the 41,031 tons of last year only cost £37,594 5s. 11d. The increased cost of coal would thus be £6670 11s. 1d. If, therefore, all other charges were fixed on last year's audited amounts—viz., £75,489 13s. 7d., the total expenditure for this year would be £82,160 4s. 8d. The estimate was put down at £80,267 12s. 1d.; the difference of £1892 12s. 7d. being chiefly accounted for by an anticipated saving in the charge for interest and annuities of £1601 14s. 1d., and of £408 1s. 8d. in expenditure on retorts and setting. The only increased charge for the year worth taking notice of, other than coal was in assessments. In the estimates they would find in detail how the revenue of £80,267 12s. 1d. was proposed to be raised. It meant an increased charge for gas all over of 2d. per 1000 cubic feet more than last year, excepting for the Dundee public lamps, which it was proposed should be charged at 3s. 5¾d.—an increase of 1¾d. compared with last year. No apology required to be made for this increase in the gas-rate, because coal, including wages, &c., was to cost them £6670 11s. 1d. more than last year, while they only expected to get £841 1s. 10d. more for secondary products. So that really they had to face an increased charge of £5829 9s. 3d., which, if taken by itself, would have meant an increase of fully 3d. per 1000 feet. Mr. Logie concluded his very lucid statement by referring to the fact that they had only £172 15s. 10d. of arrears of gas rental for the past year; that

they had reduced the unaccounted-for gas from nearly 25 per cent., the figure at which it stood when the Commission came into existence, to under 7 per cent., which represented a saving last year of about £13,000; and to the fact that, although in 1872 they resolved to set apart £500 a year for the contingent fund, they had at present a debit balance at that fund of £459 6s. 4d., which meant that nearly the whole £500 that would be payable into the fund on April 30 next, had been already expended—a state of matters which he considered not very safe. Mr. Gentle was disposed to grumble at the proposal to revive the contingent fund—a fund which he considered was fully provided for by insurance or otherwise. But he did not carry his opposition further; and the accounts were approved. It was stated in the conversation over the accounts, that the sinking fund at present amounts to £14,000.

The accounts of the Edinburgh and District Water Trust for the year ending May 15 have been made up, and they show a revenue from rates of £83,853 13s. 3d., as compared with £80,673 3s. for the previous year, an increase of £3180 10s. 3d. The gross income for the year amounted to £86,843 15s. 7d., as against £82,493 7s. 8d. the previous year, showing a gross increase of £4350 7s. 11d. The expenditure of the Trust for the year was £84,480 15s. 10d., showing a surplus of income over expenditure of £2364 19s. 9d. The original estimate for the year as regards expenditure was £84,531; and the actual payments, £84,488 15s. 10d. Among the items of expenditure were: Salaries and wages, £6658 1s. 8d.; repairs, £4094 1s. 2d.; feu-duties, rents, and taxes, £7372 1s. 3d.; interest on bonds and mortgages, £23,296 0s. 8d.; annuities, £24,220 15s. 3d; sinking fund, £8944; distribution, renewals, &c., £6426 2s. 4d. The balance at the credit of the Trust at May 15 was £11,121 9s.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

The Glasgow Corporation Gas Committee have at last entered the market for their coal supplies for the financial year which began on June 1. Their advertisement asking for tenders has created quite a buzz of excitement among colliery owners and coal merchants who have, or are likely to have, coals suitable for the wants of the Gas Trust, and capable of supplying gas of from 22 to 24 standard candles. I am told that the intention of the Coal Purchasing Committee on this occasion is to secure, if suitable terms can be agreed upon, as much coal as will serve for the whole of the year 1890-1. That means, I should say, at least 250,000 tons; and the quantity may go up to 280,000 tons, or even more. Some of the coal people who cater for gas companies and corporations are quite satisfied that they will be able to maintain the prices that have been ruling for some time; but in some quarters there is just a *leetle* doubt upon that point. By way of indicating how small a stock of coal there is to "come and go" upon, I am told that within a radius of four or five miles of Hamilton, which is an important centre of the coal-mining industry, the quantity of coal available a year ago was something like 200,000 tons; whereas it would now be difficult to scrape up even such a small quantity as 10,000 tons. My informant says that, with the exception of Greenock and Paisley, the only large town in Scotland that has yet to make its coal purchases for the year is Glasgow. Then comes in the question as to the policy of the Purchasing Committee at present buying all that they need for the year or securing small parcels to tide over their immediate wants, in the hope that the holders of the coal may feel induced eventually to accommodate their notions as to prices to those entertained by the Committee. The situation is certainly an interesting one; we shall by-and-bye see the *dénouement*.

It is expected that the income from the sale of gas by the Glasgow Gas Commissioners during the year which ended on May 31, 1890, will well-nigh reach that collected during the preceding twelve months; and that, in fact, it will do so within £2000. If that be so, it will be highly satisfactory, because the price during the past year was 2d. per 1000 cubic feet less than the price in the year 1888-9. Many people are quite anxious to know if it will be necessary to raise the price for the year now entered upon; and especialiy are the members of the Gas Committee showing anxiety on this point, as also the members of the Watching and Lighting Committee of the Board of Police. If the coal purchases are made on such favourable terms as to render it unnecessary to advance the price of the gas, then the Gas Committee may be congratulated most heartily on their good fortune, and on their excellent administration of the gas-supply undertaking of the city and most of the suburbs, and the gas consumers may rejoice over their good luck, for gas ranging from 22 to 24 candles is undoubtedly a cheap commodity, and more especially as it does not mean an additional charge in the shape of meter hire, which is still levied in many places in Scotland. As a good set-off against the increased wages account for the past year, and the higher average cost of the coals as the source of the gas, there is the very great increase in the revenue derived from the sale of residual products. I cannot tell how great the increase will have amounted to as at May 31—the close of the financial year; but I may state that at the end of the month of April the revenue from the source referred to was almost £24,000 greater than that at the corresponding date for the year 1888-9. The returns stood thus: April 30, 1890, £79,234 8s. 7d.; 1889, £55,340 2s. 6d.—or an increase of £23,894 6s. 1d.

I am glad to be able to state that Mr. Peter Watson, the Gas Manager at Stirling, who, as mentioned in last week's "Notes," met with severe injuries yesterday week through an accident, is progressing towards convalescence very satisfactorily.

The Electric Lighting Acts Amendment (Scotland) Bill was passed through Committee of the House of Commons without amendment on Friday night, after which the Solicitor-General for Scotland moved that it be read a third time. Dr. Tanner, however, objected by interposing the Standing Orders; it being past twelve o'clock. Last night the Bill was again called; and passed its last stage.

It was reported on Thursday that sulphate of ammonia had been sold at £11 per ton f.o.b. Leith.

The Glasgow pig iron market has been steady during the week. Scotch warrants, which were quoted on Monday at 44s. 3½d. per ton cash, had advanced to 45s. 4½d. yesterday afternoon. There is no special feature in regard to the market; but large shipments and withdrawals from store are having a good effect on prices.

In the Glasgow coal trade things remain in pretty much the same condition as last week. Certainly at the beginning of the week the inquiry was more sustained. But any little improvement that might be noted in that direction was lost on Thursday and yesterday; and prices may therefore be said to again incline to sag. The miners are working more regularly, and supplies can be relied upon; in fact, in one or two instances, the output has not been cleared away. Of course, if this becomes more general, lower prices will have to be accepted. There is certainly plenty of room for a reduction; and with the continued dearth of fresh work in the allied trades, iron and steel, such a lowering of quotations would appear to be near at hand. The ruling quotation this week has been 9s. As to main sorts, there has also been a slight slackening in the demand; and 8s. 6d. to 8s. 9d. per ton f.o.b. has been readily accepted by sellers. Steam, on the other hand, maintains its position; 10s. 9d. to 11s. 3d. being paid. Dross, finest quality, continues to move off well but as regards the inferior class, sales are difficult. Ell tends to ease off

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 21*.

Sulphate of Ammonia.—The market appears to be slowly emerging from its quiet condition, and a decidedly better tone is noticeable this week. The business transacted has for the most part been restricted to deliveries at Hull and Liverpool, where an advance on rates last paid has to be noted. So far, prices at London and Leith have not shown much sign of moving. Should the present improvement continue, it is not unlikely that more Continental orders, which have been kept in abeyance, may soon make their appearance, and give further impetus to the position. The sales have been at £11 2s. 6d. to £11 5s. f.o.b. Hull, and £11 5s. to £11 7s. 6d. Liverpool. Future delivery is again inquired for; but the Leith sellers, who alone are willing to make quotations, having already marketed a fair quantity of their production, ask prices so much above present ideas that nothing has been done. The advance in nitrate last reported is well maintained; and a little more than 8s. is now being offered for near cargoes, while full rates continue to be realized for later sailings. There is a firm market on spot at 8s. 1½d. to 8s. 3d. per cwt.

LONDON, *June 23*.

Tar Products.—Benzoles are firm at 3s. 10½d. for 90 per cent.; and 2s. 10d. for 50 per cent. Sellers are, however, chary of accepting these prices forward, as the time of lowest production is now approaching; and the consumption of aniline continues exceptionally large, and to all appearance likely to continue. Crude carbolic is dull of sale, at 2s. to 2s. 2d. for 60°; and crystals (34° tc 35°) are in sympathy at the reduced figure of 7d. per lb. These prices mean eventually a reduction of output. For, after all, there is a point at which it does not pay to extract this acid from tar oils, and that point seems to be near at hand, besides which carbolic acid in its original form left in the oils, has a distinct betterment value for many purposes. The recent high value of carbolic has caused these oils to be denuded greatly of their richness in this acid. Solvent naphtha and other products are dull; but that there would be a cheerful future for anthracene is the general opinion, if the present state of the market, considering the reduced stocks and increased consumption, would be taken on its merits, and this product no doubt would soon attain its proper position.

Sulphate of Ammonia.—The present price is £11 2s. 6d. for prompt delivery, with good demand. No business is reported for forward delivery.

The Lancashire Coal Trade.—For all descriptions of coal there is a slow demand, and prices are easier. Companies and private concerns who have held off buying largely while prices were kept up, are now able to secure long contracts at easy rates. There is, however, considerable irregularity about quotations; but the market is in the buyers' favour. The Yorkshire collieries are sending large quantities of slack into our market; and the competition tends considerably to a reduction upon late rates. The better qualities of slack are quoted now at 6s. 7d. to 7s. 3d.; and the commoner sorts can be bought for 6s., and in some cases 2d. less than that. Steam coal for shipment is offered at 9s. 6d. per ton delivered at the High Level, Liverpool, or Garston Docks. House coals move off slowly, and stocks are accumulating despite the fact that at most collieries the output has been considerably restricted. Best coals at the pit mouth do not fetch more than 11s. to 11s. 6d. per ton, or 10s. and 10s. 6d. for second qualities; the commoner sorts being quoted at 8s. 6d. to 9s. Burgy (ordinary qualities) does not average more than 7s. 6d. to 8s., and coke is in slow demand at a slight reduction upon rates obtainable last week.

Labour Troubles at Bromley (Kent).—Trouble has arisen among the stokers at the Bromley Gas-Works, owing to a notice having been posted up, by order of the Company's new Engineer and Manager (Mr. W. Woodward), to the effect that the men would be required, on and after the 23rd inst., to return to the old system of twelve-hour shifts, at an advance in wages of 1s. per day. The Gas Workers' Union held a meeting on the subject last Friday evening. The General Secretary (Mr. W. Thorne) presided, and strongly advised the men to work up to the last moment, and to present themselves at the works as usual on the termination of period mentioned in the notice, when if they were not admitted there would be a lock-out and not a strike. The men were contented with the eight-hour shift, which gave them opportunities of mental and physical recreation, which was necessary after the exhaustive and laborious work they had to do. They did not want the advance of 1s. a day, and would not have it forced on them in connection with four more hours' work. It was unanimously agreed that the Company's proposals should be resisted. It is reported that two of the stokers who have been for some time in the Company's service have lately been discharged; and this has tended to incense the other men. We understand that last Wednesday evening the Chairman and Directors of the Company met the stokers, when the former gave as the reason for adopting the twelve-hour shift the recent increase in the price of coal. The men, on their part, urged that this ought to affect the consumers and not them. The result of the interview was not very satisfactory.

Gas Cookery Lectures at Maidstone.—Last Thursday evening Miss C. M. Brackett gave the last of the series of cookery lectures she has been delivering in the Corn Exchange, Maidstone. The lectures have been so successful that Miss Brackett has been requested to give another series.

The Leeds Corporation and Electric Lighting.—A Sub-Committee of the Electric Lighting Committee of the Leeds Corporation visited London during last week in quest of information concerning electric lighting installations in operation. Much valuable information, it is said, was obtained; and a report will shortly be presented to the full Committee, and afterwards to the Council. Among other matters, it was ascertained that from Deptford there is now being nightly sent to the West-end electric energy for no fewer than 36,000 glow lamps.

Explosion of Gas at Halifax.—Last Saturday week a serious explosion of gas occurred at the house of Mr. A. L. Jackson, a dentist, of Halifax. Mr. Jackson had discovered a leakage of gas in the drawing-room; and a plumber (Henry Leach) was employed to do the necessary repairs. Leach, after having, as he thought, put everything right, obtained a light for the purpose of testing the work. The instant the light was applied to the burner, there was an explosion, which partially wrecked the room, blew out the windows, and severely burned the plumber, who had to be conveyed to the Infirmary. His face was badly burned; but it is stated that he is progressing favourably.

The Leeds Corporation Coal Contracts.—The tenders for the supply of gas coal to the Leeds Corporation for the ensuing twelve months—the present contracts expiring this month—came last Tuesday before the Sub-Committee to whom the question had been referred. It was found that the average price asked was about 3s. per ton more than had been paid during the past twelve months; the present rate being 1s. 6d. in excess of last year's prices, so that the total advance is equal to 4s. 6d. per ton. In consideration of this increase, the Sub-Committee declined to accept any of the tenders; the disposition of the members being to leave the matter open, and to buy in the market. It is stated that there were a great many tenders.

The Charge for Water at Widnes.—At the last meeting of the Widnes Local Board, the Gas and Water Committee recommended that from the 1st prox. the charges for water should be reduced as follows: For domestic and trade supplies, 5 per cent.; for supplies by meter, ¼d. per 1000 gallons, with a minimum charge of 7s. 6d. per quarter exclusive of meter-rent; for watering streets and flushing sewers, 1¼d. per 1000 gallons. The water accounts for the year ending March last were submitted and approved. They showed a profit of £1609 19s. 4d. Mr. Brown, in moving the confirmation of the Committee's minutes, said the profit on the water supply indicated that a great saving had been effected by the waste-water meters; and hence the reductions recommended. In St. Helens, Liverpool, Birkenhead, and Wallasey, the minimum charge for water supplied by meter was 10s. 6d.; and in Runcorn they charged 4s. for a minimum consumption of 4000 gallons. He pointed out that the reductions in the price of gas and water during the past five years, together with the increase of the illuminating power, had caused a saving to the inhabitants of Widnes amounting to about £12,000. After some conversation, the minutes were confirmed, with an alteration of the minimum charge from 7s. 6d. to 5s.

The Mid-Sussex Water Company's Additional Capital.—The Committee on the Bill promoted by the Mid-Sussex Water Company to enable them to raise further capital for the purposes of their undertaking, have presented a special report to the House of Commons on the proposals contained therein. According to the Standing Orders, all fresh capital should be put up to auction or tender, unless the Committee on the Bill think fit to dispense with this condition. In the present case, it was shown that the undertaking of the Company is in course of development, and that a considerable portion of their authorized capital is still unissued; that they have not paid any dividend on the existing share capital; and that if provision were made in the Bill for the offer of the proposed additional share capital by auction, the shares would not, in all likelihood, realize a price equal to par. If, on the other hand, the Company, having regard to the construction of the new works authorized by the Bill, were empowered to raise £25,000 (a portion of the additional capital) by shares in the manner prescribed by the Companies' Clauses Consolidation Act, 1863, they would probably be able to dispose of the shares to that amount at par, which would be advantageous both to the Company and the consumers. Under these circumstances, the Committee are of opinion that in this case the provisions of the Standing Orders ought not to be required to be complied with so far as regards the £25,000.

The Huddersfield Corporation Water Bill.—At the monthly meeting of the Halifax Town Council, last Wednesday, Alderman J. Brooke moved—"That the Water-Works Bill now before Parliament not having being adequately discussed by the Council, nor sufficient information furnished to found a decision upon, and as the Bill surrenders a valuable right belonging to the ratepayers without an equivalent in return, it is hereby resolved to withdraw the Bill and introduce it again in the next session of Parliament without the clause legalizing for ever the sale of water from the canal." He contended that the London and North-Western Railway Company had been conceded for ever a monopoly which ought to be in the hands of the Corporation. Dr. Orr seconded the resolution. The Mayor read a letter from Alderman Wright Mellor, the Chairman of the Water Committee, deprecating the suggested withdrawal of the measure. Alderman Crosland, the Vice-Chairman, also opposed the resolution, and pointed out that a clause had been inserted in the Bill prohibiting the Railway Company from increasing their present supply of water from the canal and from increasing the water-works; so that the Corporation did get an advantage out of the restriction. The motion was lost by 27 votes to 9. Mr. Beaumont next moved a resolution, calling upon the Water Committee to present a detailed report of their proceedings in reference to the Bill; the report to contain more particularly the engagements entered into with all parties, a copy of the printed evidence, the reasons for the withdrawal of the Bill, the arrangements which caused the Wessenden Commissioners to withdraw their Bill, and details of the expenditure incurred by them in relation thereto. The resolution was seconded by Alderman Hirst; but, after discussion, was defeated by 13 votes to 11.

Gainsborough Water Supply.—The inhabitants of Gainsborough are now receiving a supply of water from their artesian well, the completion of which has been considerably delayed. The source of supply hitherto has been the River Trent.

The Pollution of the River Lea.—The Lea Conservancy Board have given notice of appeal against the decision of the Edmonton Magistrates, reported in the JOURNAL last week, in the case against the Tottenham Local Board of Health with regard to the pollution of the River Lea. It may be remembered that the summons was dismissed on the ground that the wrong parties were before the Court.

Fire Caused by an Escape of Gas.—Owing to an escape of gas, a serious fire was caused early last Thursday morning at All Saints' Street, Caledonian Road, on the premises of Messrs. Thorley and Co., cattle food manufacturers. The store on the first floor of a large building was set on fire; and two stand-pipes had to be set to work to overcome the flames, which eventually caused considerable damage.

Gas Exhibition and Cookery Lectures in North London.—Miss Wilkinson gave a course of lectures from the 17th to the 20th inst. at the hall opposite the Finsbury Park station of the Great Northern Railway, and they were well attended. Gas-stove appliances were exhibited by Messrs. Fletcher, Davis, Leoni, Main, and Sugg. The last-named firm showed on Friday the first of their new enamelled cooking-stoves—an advantage for keeping clean the inside and hot plate of the stove. Messrs. Slatter and Watkins, of Little Marlborough Street, W., had on view specimens of their new safety gas regulator.

Opposition to Electric Lighting at Woking.—A Vestry Meeting was held at Woking a few days since to take into consideration the advisability or otherwise of lighting a part of Woking with electricity. A resolution was moved, proposing that electricity be adopted in the "station district;" and that "a rate be made to cover the cost of the same over the entire parish." Tradesmen residing in other parts of the district were not quite satisfied with this arrangement; and an amendment was moved, which, while recognizing that an efficient method of lighting should be adopted round the station, pointed to the desirability of the cost being defrayed in that area. This amendment was carried, amid laughter and cheering, by 67 votes to 3.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1180.

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Apr.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	12⅞—13⅛	+1	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	109—111	..	4 10 1
100,000	20	30 May	8	Bahia, Limited	20	19—21	..	7 12 4
200,000	5	15 May	7½	Bombay, Limited	5	7¼—7⅜	..	4 16 8
40,000	5	,,	7½	Do. New	4	4⅝—5¼	..	5 17 10
380,000	Stck.	27 Feb.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	160—165	..	5 12 2
220,000	20	13 Mar.	11	Brighton & Hove Original	20	40—42	..	5 4 9
320,000	20	28 Mar.	11¼	British	20	43—45	..	5 0 0
50,000	10	13 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	13⅞—14⅜*	..	5 10 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	105—108	..	5 11 1
150,000	20	27 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Apr.	13½	Commercial, Old Stock	100	249—254	..	5 8 3
130,000	,,	,,	10½	Do. New do.	100	202—206	+1½	5 4 4
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 3
557,320	20	13 June	13	Continental Union, Limited	20	47—49*	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	38—40*	+1	5 0 0
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
234,060	10	30 Jan.	13	European, Limited	10	27—28	..	4 12 10
120,000	10	,,	13	Do. New	7½	18½—19½	..	5 0 0
354,060	10	,,	13	Do. do.	5	13—14	..	4 12 10
5,470,620	Stck.	13 Feb.	13½	Gaslight & Coke, A, Ordinary	100	246—251	+1	5 9 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—103	..	3 17 8
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	253—258	..	3 17 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	121—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	162—166	..	4 4 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
1,061,150	,,	13 June	4	Do. 4 p. c. Deb. Stk.	100	115—120*	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—128*	..	3 10 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	163—168*	..	3 11 5
3,800,000	Stck.	15 May	12	Imperial Continental	100	218—223	+1	5 7 7
75,000	5	13 June	6	Malta & Mediterranean, Ltd.	5	5—5⅜*	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	112—114	..	4 7 9
541,920	20	13 June	6½	Monte Video, Limited	20	20½—21½*	..	6 0 11
150,000	5	30 May	10	Oriental, Limited	5	8⅝—9	..	5 11 1
60,000	5	28 Mar.	7	Ottoman, Limited	5	5⅝—6	..	5 16 8
166,870	10	26 July	4	Pará Limited	10	4—5	+⅛	8 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	16 Apr.	10	San Paulo, Limited	10	15—16	+⅛	6 5 0
500,000	Stck.	27 Feb.	13½	South Metropolitan, A Stock	100	285—295	..	4 9 10
1,350,000	,,	,,	11½	Do. B do.	100	230—235	..	4 17 10
141,500	,,	,,	12	Do. C do.	100	247—252	+2	4 15 3
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	27 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	260—265*	..	3 11 8
1,720,560	Stck.	16 Apr.	7½	East London, Ordinary	100	215—219	—1	3 8 6
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	144—149	..	3 0 5
700,000	50	13 June	9	Grand Junction	50	122—126*	..	3 11 5
708,000	Stck.	13 Feb.	10½	Kent	100	275—289	..	3 15 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	255—260	..	3 13 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	122—126	..	3 3 6
500,000	100	13 Feb.	12½	New River, New Shares	100	367—372	..	3 5 2
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk	100	127—130	..	3 1 6
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170—174*	+2	3 9 0
126,500	100	,,	6	Do. 7½ p. c. do.	100	158—163*	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex.	100	260—265*	+2	3 15 6

*Ex.div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

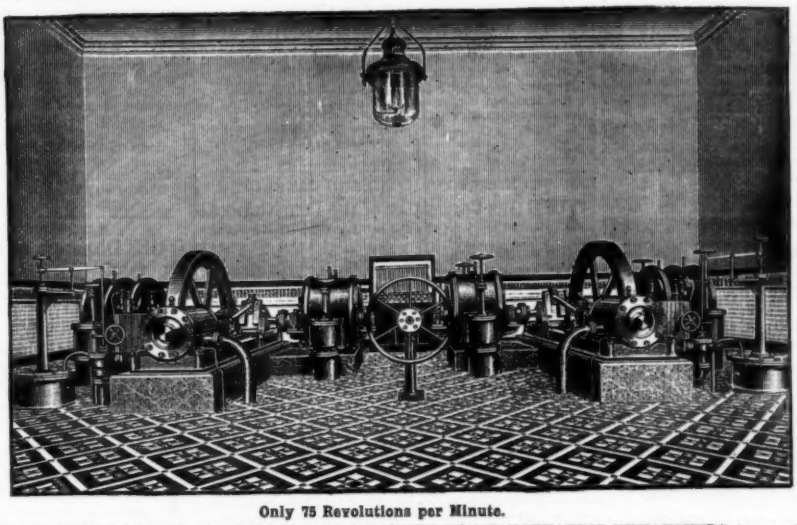
Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 28,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.

Catalogues and Testimonials on application at the above address.



Only 75 Revolutions per Minute.

The above Engraving shows Two Engines driving Four GWYNNE & CO.'S PATENT NON-FLUCTUATING EXHAUSTERS to pass 200,000 cubic feet per hour (without the slightest oscillation), at the EFFINGHAM STREET GAS-WORKS, SHEFFIELD.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH; NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.

For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

GAS Authorities requiring Second-hand GAS APPARATUS—Mouthpieces, Hydraulic Mains, Condensers, Purifiers, Exhausters, Station Meters, &c. Also superior quality Gas-Purifying BOG ORE (OXIDE OF IRON). Please address, D. M. NELSON AND SONS, 164, St. Vincent Street, GLASGOW. (Telegraphic Address: "GAS GLASGOW.")

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

DEATH.

GAINES.—On the 19th inst., at 113 Stepney Green, JOHN MICHAEL GAINES, aged 69 years. For 45 years in the service of the Commercial Gas Company.

SITUATION Wanted, as Gas-Fitter, &c. Used to Stove and Meter fixing. Have a good knowledge of Smith's work. Good references. Age 22.

Address, W. MILLER, 3, St. George's Place, Lower Mortlake Road, Richmond, SURREY.

WANTED, a Steady Man to look after the Gas-Works at Kirkwall, Orkney. Must be practical in all Departments—Mains and Services, and will have to take Meter Readings. Wages £60, with House.

Apply to HENRY BALFOUR AND CO., Engineers, Leven, FIFE.

WANTED, Inspector of Water-Works Fittings. A man who has served his time as a Plumber preferred Permanent and constant employment. Wages 35s. a week.

Apply, stating age, experience, and present employment, to H. FRANCIS, ASSOC. M. Inst. C.E., Water-Works, DEVONPORT.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1156 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, a thoroughly good Retort Setter. Good Wages and permanent Situation to a suitable Man.

Address No. 1833, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady respectable man as STOKER, and to make himself generally useful on a small Country Gas-Works. Constant employment.

Address, the MANAGER, Gas-Works, OAKHAM.

THE Corporation of Middleton are prepared to receive applications for the Office of GAS MANAGER from persons well qualified to Superintend and Manage a Gas-Works. He will be required to devote the whole of his time to the duties of the Office. The annual make of Gas is about 75 million cubic feet.

Applications, stating age, qualifications, and salary required, accompanied by testimonials of recent date (not exceeding three in number), to be sent to my Office on or before the 16th of July, 1890, endorsed "Gas Manager."

Personal canvassing directly or indirectly strictly prohibited, and will disqualify Candidates.

FREDERICK ENTWISTLE, Town Clerk.

Town Hall, Middleton, near Manchester, June 20, 1890.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 1208.

Inquiries should be addressed to THE COZE SYNDICATE, LIMITED, 86-88A, LEADENHALL STREET, E.C.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house
17, NEWTON STREET, PICCADILLY, MANCHESTER.

FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.

Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

FOR SALE—One 8-horse power Engine and COAL BREAKER, with top and bottom Elevator, Gear, and Patent Wrought-Iron Chain, with Malleable Iron Buckets complete.

The above Machinery is almost new, having only been in use about Three months.

For further particulars, apply to the COAL DISTILLATION COMPANY—COOPER'S PATENTS—LIMITED, 322 and 323, Winchester House, Old Broad Street, LONDON E.C.

FOR SALE—Seven Purifiers, 15 feet square, with Sieves, Connections, Valves, and Lifting Apparatus complete.

One PURIFIER, 20 ft. by 16 ft., with Sieves, Connections, Valves, and Lifting Apparatus complete.
One SCRUBBER, 20 ft. by 6 ft. diameter.
(The above may now be seen at work.)
Two Wrought-Iron TANKS, 8 feet diameter by 7 feet and 6 feet respectively.
One REID'S GAS WASHER.
Two Cast-Iron TANKS, 15 ft. 8 in. diameter by 11 ft. 4 in. and 8 ft. 6 in. respectively.
Two EXHAUSTERS (Jones), equal to 25,000 cubic feet per hour.
A number of 15-inch and other VALVES.
A quantity of SHAFTING and PULLEYS.

J. HEPWORTH,
Gas-Works, Carlisle, April 28, 1890.

FOR SALE—A Kirkham, Hulett, and Chandler's WASHER-SCRUBBER, of a capacity of 300,000 cubic feet per day; also a 12-inch GOVERNOR by Peebles.

Can be seen at work on application to F. C. Humphrys, Gas-Works, Ilkeston.

STENCIL PLATES.

TO ENGINEERS AND ALL WHO DRAW PLANS.

TO BE SOLD, a magnificently executed Set for LETTERING PLANS, &c. The Set consists of TEN COMPLETE SETS of ALPHABETS, plain, shaded, and ornamental; FOUR SETS of FIGURES in various Styles; and FIFTY PLATES of all the principal words used upon Engineering Drawings, including Scales, Points, Corners, &c., in mahogany case, with Brushes. Price for the whole 30s.

Apply to Mr. G. Baker, 22, Orpingley Road, Hornsey Road, London, N.

SOUTH METROPOLITAN GAS COMPANY.

£28,000 of Five per cent. Perpetual Debenture Stock, and £25,000 Ordinary "C" Stock of the above Company, presenting Investments of the soundest description.

MESSRS. G. A. WILKINSON and SON are instructed by the Directors to SELL by AUCTION, at the Mart, on Monday, July 14, at Two o'clock precisely, in numerous Lots, to suit large and small purchasers, £28,000 of FIVE per CENT. PERPETUAL DEBENTURE STOCK, and £25,000 ORDINARY "C" STOCK in the South Metropolitan Gas Company.

The districts supplied by the Company comprise nearly the whole of the South of London from Wandsworth to Plumstead Marshes; and the demand has so much increased that the supply of Gas has been nearly doubled within the last Ten years.

Particulars may be had of Frank Bush, Esq., Secretary of the Company, 709A, Old Kent Road; of Messrs. Johnson, Budd, and Johnson, Solicitors, 24, Austin Friars; and of Messrs. G. A. Wilkinson and Son, Surveyors and Auctioneers, 7, Poultry, City.

TO INVESTORS AND CAPITALISTS.

THE KETTERING WATER-WORKS COMPANY.
ISSUE OF NEW ORDINARY SHARES.

MESSRS. ROBINSON and SON are instructed by the Directors to offer for SALE by PUBLIC AUCTION, in Lots, at the Corn Exchange, Kettering, on Friday, July 11, 1890, at Half-past Five for Six o'clock in the evening precisely, pursuant to the Provisions of the Kettering Water-Works Act, 1889 (under which all new Shares are to be offered for Sale by Auction or by Tender before being offered to the existing Shareholders), 1000 NEW ORDINARY SHARES of £10 each in the above Company, part of an additional Capital authorized to be raised for the purposes of the New Works now in course of construction, and which have been rendered necessary by the constantly-increasing demand for the Company's Water, consequent upon the extraordinarily rapid growth of the population and industries of the Town.

For information as to the Company's position, its existing and new Works, and the Dividends lately paid on its present Capital, with printed particulars and conditions of the present issue, apply to the Auctioneers; to Messrs. G. and H. Lamb and Stringer, Solicitors; or to the Secretary of the Company; all of Kettering.

THE East Dereham Local Board invite TENDERS for the supply of about 1000 tons of GAS COAL for the ensuing year.

Tenders, on forms to be obtained from me, must be sent in by the 1st day of July, 1890.

B. H. Vores, Clerk to the Local Board.

East Dereham.

THE Directors of the Thrapston Gas and Coke Company, Limited, are desirous of receiving TENDERS for the supply of 450 to 500 tons of Best GAS COAL, from the 30th of June, 1890, to the 30th of June, 1891, to be delivered as ordered at Thrapston Station.

Tenders received up to the 1st of July.

Thomas Eaton, Secretary.

Thrapston, June 16, 1890.

COAL TENDERS.

THE Directors of the Wakefield Gaslight Company, are prepared to receive TENDERS for the supply of 24,000 tons of GAS COAL and NUTS.

Forms of tender may be had on application, and must be sent in, properly endorsed, not later than the 28th inst.

By order,
John W. Whitaker,
Secretary and Manager.

Gas Offices, June 16, 1890.

TO COLLIERY PROPRIETORS.

THE Directors of the Sevenoaks Gas Company are prepared to receive TENDERS on or before Saturday, July 5, 1890, for the supply of about 4000 tons of GAS COAL to be delivered at the Bat and Ball Station (L.C. & D. Railway), Sevenoaks, during the ensuing Year.

Forms of tender, and conditions of delivery may be had on application to the undersigned.

Henry How, Secretary.

Gas Office, 88, High Street, Sevenoaks,
June 18, 1890.

TAR.

THE Directors of the Cheltenham Gas-light and Coke Company invite TENDERS for the purchase of the surplus TAR made at their Works for One, Two, or Three years, commencing on the 1st day of October, 1890.

Particulars may be obtained from the undersigned, to whom tenders must be sent on or before the 17th day of July next.

The Directors do not bind themselves to accept the highest or any tender.

R. O. Paterson, Engineer.

Gas-Works, Cheltenham,
June 21, 1890.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Directors of the Hednesford Gas Company, Limited, invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR made at their Works during the year ending June 30, 1891.

Delivery into Contractor's Tank-Wagons, at Hednesford.

Thos. Evans, Secretary.

TENDERS FOR GAS COAL.

THE Committee of the Warwick Gas-light Company are prepared to receive TENDERS for the supply of GAS COAL for a period ending the 30th of June, 1891.

Tenders to be delivered on or before July 9, 1890.

For forms of tender and further particulars, apply to the undersigned.

Walter T. Tew,
Clerk to the Company.

Warwick, June 11, 1890.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee of the Penrith Local Board are prepared to receive TENDERS for the supply of about 2500 tons of GAS COAL and 500 tons of CANNEL during the year ending June 30, 1891.

Tenders, endorsed "Tender for Coal," to be delivered to Mr. G. Wainwright, Public Offices, Penrith, not later than Monday, the 30th of June, 1890.

Further particulars may be obtained from
Edward Shaul, Manager.

Gas-Works, Penrith,
June 13, 1890.

CITY OF CARLISLE.

TAR CONTRACT.

THE Carlisle Gas Committee are prepared to receive TENDERS for the surplus TAR to be produced at their Works, for a period of One or more years from the 30th of June next.

Any further particulars required can be obtained upon application to the Engineer, to whom sealed tenders, endorsed "Tender for Tar," must be delivered on or before June 28, 1890.

The Committee do not bind themselves to accept the highest or any tender.

J. Hepworth,
Engineer and Manager.

Gas-Works, Carlisle, June 10, 1890.

CITY OF CARLISLE.

TENDERS FOR COAL AND CANNEL.

THE Carlisle Gas Committee are prepared to receive TENDERS for the supply of about 14,000 tons of Screened or Unscreened GAS COAL and about 3000 tons of CANNEL, to be delivered at their Works in Carlisle in such quantities as may be directed, from July, 1890, to June, 1891.

Tenders, specifying the description of the Coal or Cannel, the pits at which they are raised, and the terms for net monthly payment, are to be sent on or before June 28, 1890, endorsed "Tender for Coal."

J. Hepworth,
Engineer and Manager.

Gas-Works, Carlisle, June 10, 1890.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS (from Colliery Proprietors only) for the supply of 46,000 tons of GAS COAL, and 10,000 tons of CANNEL COAL, to be supplied in such quantities as may from time to time be determined by the Gas-Works Committee during the year ending the 30th of June, 1891.

Forms of tender and further information may be obtained on application to Mr. Thomas Holgate, Manager, Gas-Works, Halifax.

Tenders, endorsed "Tender for Coal," must be sent to me on or before Ten o'clock on the 27th of June, 1890.

The lowest or any tender not necessarily accepted.

By order,
Keighley Walton, Town Clerk.

Town Hall, Halifax, June 13, 1890.

TO COLLIERY PROPRIETORS.

THE Gas Committee of the Stafford Corporation are prepared to receive TENDERS for the supply of 10,000 tons of COAL for Gas-Making Purposes.

The Coal to be delivered during the Twelve months ending July 31, 1891, in about equal monthly quantities.

Forms of tender, and any further information required, may be obtained on application to Mr. J. F. Bell, Gas Engineer, Stafford.

Tenders, sealed, and endorsed "Tender for Gas Coal," to be sent to me on or before Saturday, the 28th inst.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
Matt. F. Blakiston, Town Clerk.

Stafford, June 13, 1890.

TENDERS FOR GAS COAL.

THE Directors of the Sunderland Gas Company are prepared to receive TENDERS for GAS COAL (in lots of 5000 tons and upwards), to be delivered by Rail on the Company's Sidings at Hendon, or at Ayre's Quay Gas-Works, in such monthly proportions, from Nov. 1, 1890, to June 30, 1891, as the make of Gas may render necessary.

The Coal to be clean, dry, and fresh worked.

Tenders, endorsed "Tender for Gas Coal," specifying the description of Coal, the name of the Pit, and the particular Seam from which the Coal is to be supplied, to be left at the Offices of the Company, Borough Road, Sunderland, on or before Ten a.m. on Tuesday, July 1.

Short weight or inferior quality to be allowed for.

The Company do not bind themselves to accept the lowest or other tender until after a satisfactory trial of the coal to which such tenders may relate shall have been made.

J. H. Cox, Secretary.

Sunderland, June 21, 1890.

BRUSSELS GAS WORKS.

SALE OF TAR.

THE Communal Administration of Brussels will, on the 19th of August, 1890, proceed to Open TENDERS for the purchase of TAR produced at the Gas-Works during One year from Oct. 1, 1890.

The Contract is divided in two Lots of 1800 tons each.

For all particulars, address M. le Directeur de l'Usine a Gaz, Rue du Chêne, 8A, Brussels.

CORPORATION OF MOSSLEY.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the surplus TAR that may be produced at their Gas-Works, Roaches, for Twelve months from the 30th of June.

Particulars and form of tender may be obtained from the Manager, Mr. R. Merrell, at the Gas-Works.

Tenders, endorsed "Tender for Tar," to be delivered by noon on Monday, July 7, at the Town Clerk's Office, Mossley.

The Committee do not bind themselves to accept the highest or any Tender.

Joseph Hyde, Town Clerk.

TENDERS FOR GAS COAL.

THE Directors of the Newark Gas Company are prepared to receive TENDERS for the supply of about 3000 tons of good GAS COAL to be delivered free, at Newark Great Northern Railway Station, at such times and in such quantities as may be required, from the 1st day of September next, to the 30th of June, 1891.

Tenders, properly endorsed "Tenders for Gas Coal," to be sent to the undersigned, on or before the 30th inst.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
F. B. Footitt, Secretary.

Gas Offices, Newark,
June 20, 1890.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Company are prepared to receive TENDERS for the purchase of the surplus TAR, produced at their Works, from the 1st day of July next, until the 30th day of June, 1891.

Payments. cash monthly.

Further particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 30th inst., marked on the outside, "Tender for Tar."

The Directors do not bind themselves to accept the highest or any tender.

By order,
F. B. Footitt, Secretary.

Gas Offices, Newark,
June 20, 1890.

COUNTY BOROUGH OF SALFORD.

(Gas Department.)

TAR.

THE Gas Committee invite Tenders for the purchase and removal of the surplus TAR to be produced at their Bloom Street, Regent Road, and Liverpool Street Works in Twelve months from July 13 next.

The approximate quantity will be 4500 tons.

Forms of tender and conditions of contract may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Tar," addressed to the Chairman of the Gas Committee, must be delivered to me on or before Thursday, the 10th prox., at Five o'clock in the evening.

By order,
Saml. Brown, Town Clerk.

Town Hall, Salford, June 12, 1890.

COUNTY BOROUGH OF WIGAN.

(Gas Department.)

TO COLLIERY PROPRIETORS.

THE Gas Committee are prepared to receive TENDERS for the supply of best screened GAS COALS, COBBLES, or NUTS for their Gas-Works.

The quantity required is 12,000 tons of 20 cwt. to the ton, to be delivered on the Gas-Works Siding, between the 1st of July, 1890, and the 30th of June, 1891, in such quantities and at such times as the Gas Engineer may require.

The Committee do not bind themselves to accept the lowest or any tender; and they reserve to themselves the right to divide the contract between several firms.

Forms of tender may be obtained on application to the undersigned.

Sealed tenders, properly endorsed, to be addressed to Arthur Smith, Town Clerk, and delivered on or before Saturday, the 28th inst.

Jos. Timmins, Engineer, &c.

June 19, 1890.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 50,000 tons of best, well screened, large GAS COALS, to be delivered between July, 1890, and June 30, 1891, in monthly quantities in accordance with the Specification.

Parties tendering may do so for the whole quantity, or for quantities from 5000 tons upwards.

Forms of tender and specification of monthly deliveries may be obtained on application to Mr. H. Morley, the Company's Engineer.

Sealed tenders to be sent to the undersigned not later than Thursday, the 17th day of July next, addressed to the Chairman of the Company, and endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
George Clarry, Secretary.

Gas Office, Cardiff, June 20, 1890.

COKE AND TAR.

THE Directors of the Nuneaton Gas Company invite TENDERS for the surplus COKE and TAR to be produced at their Works for One year from the 1st of July next.

Quantity of Coke, about 800 tons; quantity of Tar, about 150 tons.

Tenders, sealed and endorsed, must reach me not later than the 10th of July.

JOHN H. BLAND,
Secretary.

Nuneaton, July 19, 1893.

NELSON LOCAL BOARD.

TENDERS FOR GAS COAL.

THE Nelson Local Board Gas Committee invite TENDERS for the supply of 12,000 tons of GAS COAL, to be delivered at the Lancashire and Yorkshire Railway Siding, or at the Leeds and Liverpool Canal Wharf, Nelson.

Conditions and forms of tender may be obtained from Mr. Wm. Foster, Gas Engineer, Nelson.

Sealed Tenders to be addressed to the Chairman of the Gas Committee, endorsed "Gas Coal," and sent or delivered to me not later than Friday, the 4th prox.

By order,
R. M. PRESCOTT,
Clerk to the Board.

Town Hall, Nelson, Lancs.
June 12, 1890.

HARTLEPOOL GAS AND WATER COMPANY.

THE Directors of the Hartlepool Gas and Water Company are prepared to receive TENDERS for the supply and erection at their Works, West Hartlepool, of a WASHER, or WASHER-SCRUBBER, capable of dealing with 1½ million cubic feet of Gas per diem.

Plans, showing proposed position of the Washer, together with any further information, may be obtained on application to the Company's Engineer, Mr. Thomas Bower.

Tenders, sealed, and endorsed "Tender for Washer," to be sent to the undersigned not later than Tuesday, the 8th day of July next.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS TREWHITT, Secretary.

Gas-Works, West Hartlepool, June 16, 1890.

COUNTY BOROUGH OF SALFORD.

TENDERS FOR GENERAL STORES.

THE Gas Committee of the Corporation are prepared to receive TENDERS for the following MATERIALS in such quantities as may be required during the Twelve months, following the acceptance of the Tender, viz.:—

Iron and Steel.	Oils, &c.
Tin Sheets, &c.	Cotton Waste.
Lead and Composition Pipes, Glass, Pig-Lead, &c.	India-rubber Sheetings, Rings, &c.
Bolts, Nuts, Rivets, &c.	Lias Lime and Cement.
Iron Castings.	Timber.
Brass Meter Taps and Keys, &c.	Rope, Tarred and Spun Yarn.
Gas Tubing and Fittings.	Haulage.
Gas-Meters.	Horse Provender.
Paints, &c.	Veterinary Expenses
Chandlery.	Brushes and Besoms.
	Steel Shovels.

Forms of Tender and all further information may be obtained on application to the Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Miscellaneous Goods," together with Samples of Goods offered, addressed to the Chairman of the Gas Committee, Town Hall, Salford, must be delivered to me on or before the 10th prox., at Five o'clock in the evening.

By order,
SAML. BROWN, Town Clerk.

Town Hall, Salford, June 18, 1890.

TENDERS FOR GAS COAL.

THE Directors of the Victoria Newmarket Gaslight and Coke Company, Limited, invite TENDERS for the supply of 3500 tons of best screened GAS COAL, during the ensuing Twelve months, ending June 30, 1891.

Tenders, stating price per ton, delivered free at Newmarket Station as required, to be sent on or before July 5, 1890, to the undersigned, from whom any further particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket, June 19, 1890.

TO TAR DISTILLERS

THE Directors of the Oxford Gaslight and Coke Company invite TENDERS for the purchase of the surplus TAR produced at their Works for either One or Two years, commencing the 1st of July next, delivered into Boats or Railway Trucks.

Quantity, about 250,000 gallons per year.

Further particulars may be obtained from the Company's Engineer and Manager, Mr. J. Eldridge,

Sealed tenders, addressed to the Chairman, Wood Lawn, Oxford, and endorsed "Tender for Tar," to be sent in not later than Monday, the 30th inst.

The Directors do not bind themselves to accept the highest or any tender.

By order,
JOHN HESTER, Secretary.

Gas-Works, Oxford,
June 21, 1890.

BOROUGH OF BURTON-UPON-TRENT.

RESIDUAL PRODUCTS.

THE Gas Committee of the Burton-upon-Trent Corporation invite TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR to be produced at their Works during Twelve months, from the end of July next.

Probable quantity of Coal carbonized during the Twelve months, 21,000 tons.

The Liquor and Tar will be delivered free into Contractor's Tank-Trucks on the Gas-Works Railway Siding.

The Strength of the Liquor will be tested by Twaddell's Hydrometer; and persons tendering are requested to state the price per ton to be paid for each ½° of strength from 3½° to 8°.

Payments, net cash monthly.

Separate tenders for Liquor and Tar, sealed, and endorsed "Tender for Residual Products," are to be delivered to me at or before Ten a.m., on Saturday, the 28th of June inst.

The highest or any tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
June 9, 1890.

COUNTY BOROUGH OF STOCKPORT.

SEWAGE OUTFALL SCHEME.

THIS Corporation intend to Construct SEWAGE OUTFALL WORKS and intercepting SEWER or SEWERS for the Borough and adjacent parts, and desire Engineers who may be willing either to submit a Scheme or to be interviewed with a view of the Corporation either inviting competition for some Scheme, or selecting some Engineer to devise a Scheme adapted for the requirements of the Borough, to communicate Names and Addresses, with nature of experience in similar Works, to the TOWN CLERK, STOCKPORT.

June 12, 1890.

THE Local Board for the District of Bishop's Stortford are prepared to receive TENDERS for LIGHTING the PUBLIC STREETS at present lighted of the District of Bishop's Stortford for One year, from the 16th day of August next.

Tenders are to be delivered to me, the undersigned not later than Thursday, the 17th day of July next.

By order of the Board,
W. P. SLATER, Clerk.

North Street, Bishop's Stortford,
June 13, 1890.

HEALTH Exhibition, Royal Pavilion, BRIGHTON, including Sanitary Apparatus and Appliances, Arrangements for Water Supply, Heating and Cooking Apparatus, Electric Lighting, Smoke-Preventing Appliances, Articles relating to Personal Hygiene, Domestic Economy, Foods, Clothing, Life and Labour Saving Appliances, &c., to be held from Aug. 25 to Sept. 13, 1890, in connection with the AUTUMN CONGRESS OF THE SANITARY INSTITUTE.

Prize Medals and Certificates of Merit will be awarded for Approved Exhibits.

Forms of application for space and all particulars can be obtained from the CURATOR (Mr. W. H. Knight), 74a, Margaret Street, LONDON, W.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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Chemist and Superintending Gas Examiner to the London County Council.

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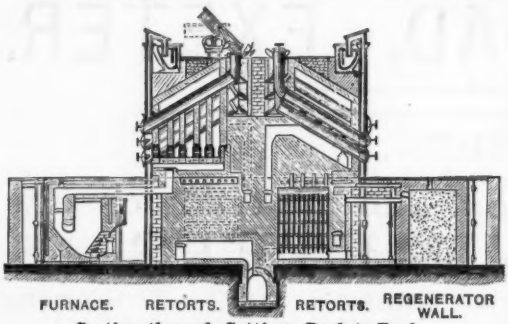
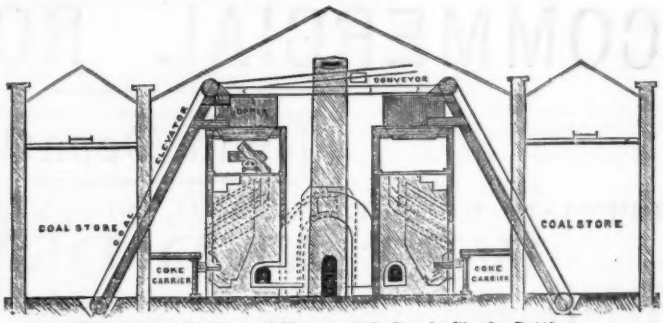
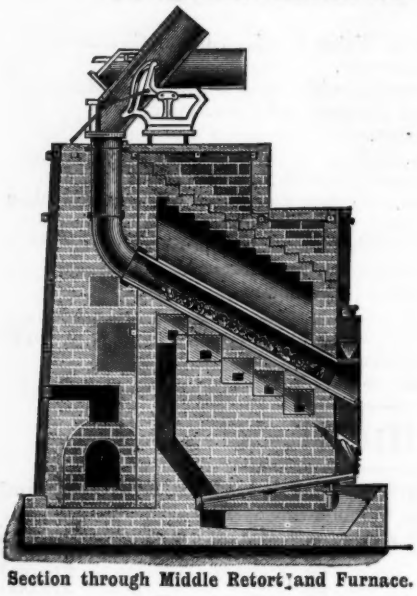


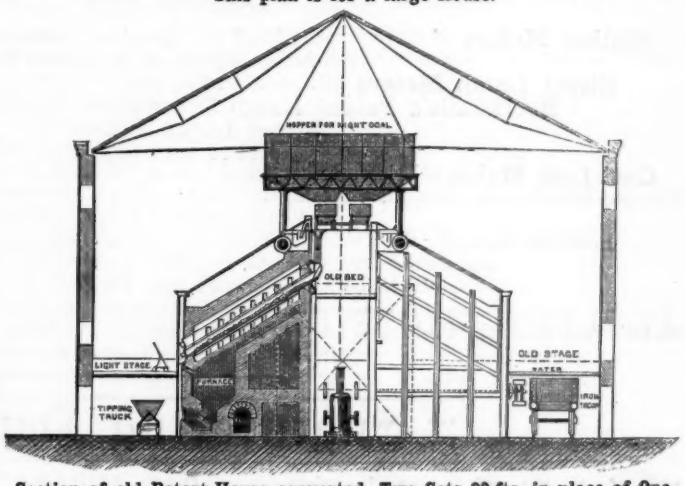
Section through Settings Back to Back.
Working off ground floor with Generator under Stage and Regenerator under the Sets.



Transverse Section of House with Coze's Single Settings,
Showing Method of working Two Single Settings and Distributing the Coal to the Supply Hoppers; the whole of the work being Automatic.
This plan is for a large House.



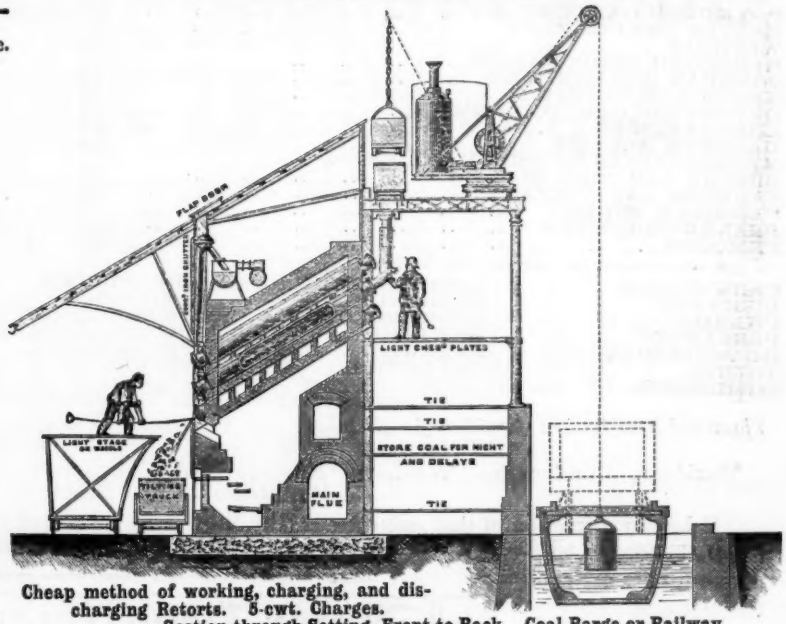
Section through Middle Retort and Furnace.



Section of old Retort-House converted, Two Sets 20 fts. in place of One.
Modified form, with ordinary Retorts and Fittings.

Front View.

Section through Furnace & Bed.



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Section through Setting, Front to Back. Coal Barge or Railway.
Light Corrugated Roof over Sets and at Sides.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

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The most Economical Gas-Generating System in the World.

Process and Apparatus patented in all Countries.

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RED OXIDE OF IRON PAINT.

THE BEST KNOWN PRESERVATIVE FOR IRONWORK.

Sold in large quantities on better terms than can be obtained from any other manufacturer.

Also sold in powder in 1 cwt. kegs, at 7/6 per cwt.

In oil as a paste ready for mixing, at 25/- per cwt.

As a paint ready mixed for use, at 3/9 per gallon, in 5-gallon cans, or in packages to suit buyers.

INQUIRIES SOLICITED.

Boiler Incrustation Prevented

BY USING

Used at the following Gas-Works:—Ascot, Birmingham, Broadstairs, Bromsgrove, Hendon, Leven, N.B., Pembroke, Seaham Harbour, Stamford, Warwick, &c., &c.; and by leading Engineers throughout the country.

Absolutely harmless, and the most economical means of preventing Incrustation obtainable.

TESTIMONIALS ON APPLICATION.

ADOLPHE CROSBIE, Walsall Street Chemical Works, WOLVERHAMPTON.

CUTLER'S PATENT Guide-Framing for Gasholders.

STRONG. SAFE. CHEAP.

Copy of Letter received from TUNBRIDGE WELLS GAS COMPANY.

Gas Company's Offices, Tunbridge Wells,

April 1, 1890.

Dear Sirs,

I am instructed by the Directors to express their great satisfaction with the Gasholder you constructed for this Company last year, and which is provided with your PATENT SYSTEM OF GUIDE-FRAMING.

The Engineer has reported very favourably, not only of the work itself, which is excellent but of the merits of the PATENT GUIDE-FRAMING, which he thinks fully justifies all you claim for it.

The Directors also appreciate the liberal way in which you interpreted your obligation as to the strength of the material to be used, which, now that the work is completed, is found to be no doubt stronger than it need have been; but inasmuch as our Gasholder was the first to which the System had been applied, they think you did wisely in not reducing the material to the limits which are no doubt perfectly possible in such a Guide-Framing.

I am, Dear Sirs, yours truly,

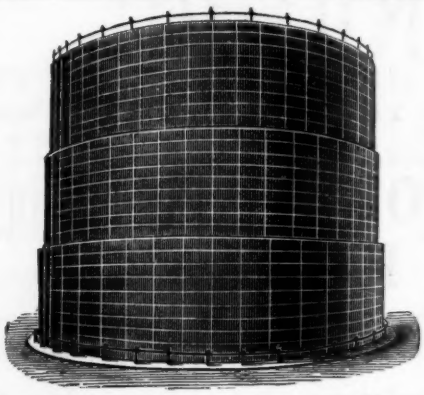
(Signed) JOHN READ, Secretary.

Messrs. S. CUTLER & SONS,
Great George Street Chambers,
16, Great George St., Westminster, S.W.

REVOLUTION
IN GASHOLDER CONSTRUCTION.
(GADD & MASON'S PATENTS.)

IMMENSE SAVING IN COST.
NO COLUMNS. NO FRAMING.
NO PIERS ROUND TANK.
GREATER STABILITY.
TILTING IMPOSSIBLE.

Tank Construction rendered simpler and very much cheaper; the Piers and heavy Base Stones being dispensed with.



In Holders for Export a very large additional saving is effected in Carriage, Freight, Transport and Insurance; the Weight being reduced nearly 50 PER CENT.

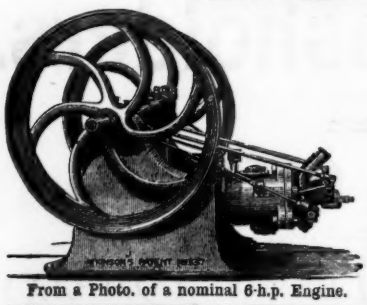
Engineers intending to extend their Gas Storeage should not fail to see the Two-Lift Holder erected for the Northwich Gas Company.

ADMITTED BY EMINENT ENGINEERS TO BE THE SYSTEM OF THE FUTURE.

Telegrams: "SPIRAL MANCHESTER."

THE PATENT GASHOLDER SYNDICATE,
504, STOCKPORT ROAD, MANCHESTER.

MANLOVE, ALLIOTT, & Co., Ltd.,
ENGINEERS,
NOTTINGHAM,
LONDON, MANCHESTER, AND GLASGOW.



From a Photo. of a nominal 6-h.p. Engine.

ATKINSON'S **"CYCLE"** PATENT
GAS-ENGINE.

The simplest and most economical Gas-Engine made.
THE BEST ENGINE FOR ELECTRIC LIGHT.
Consumes less Gas per brake horse power than any other Gas-Engine.

Telegraphic Address: "MANLOVES NOTTINGHAM."

RETORT SETTINGS IMPROVED
BY ADOPTING
THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.
HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,
CONTRACTORS FOR GAS AND WATER WORKS,
20, BUCKLERSBURY, LONDON, E.C.

JAMES D. PERKINS. F. SEAVERNS.

PERKINS & Co.,

228 & 229, PRODUCE EXCHANGE, NEW YORK.

Cable Address: "PERKINS, NEW YORK." *Post Office Box 3695, New York.*

SOLE AGENTS FOR THE CELEBRATED

BRECKENRIDGE CANNEL

AND THE

OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA & VIRGINIA GAS COALS, & AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

GREAT BRITAIN, ON THE CONTINENT, OR SOUTH AMERICA.

Full Information furnished upon Application to the above Address.

"LIGHT, Wenham Gas Lamps MORE LIGHT."

ITS ADVANTAGES ARE:

IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.

INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.

Absence of Downward Shadow. *Practical Completeness of Combustion.*

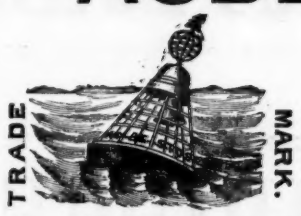
CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.

CAN BE USED AS VENTILATING LIGHTS, whereby the products are removed, and damage to decorations, &c., prevented.

SOLE PROPRIETORS AND MANUFACTURERS: **THE WENHAM COMPANY, LIMITED.**

Birmingham Branch: 121, CORPORATION STREET. Works: UPPER OGLE ST., LONDON, W. Manchester Branch: 5, DEANSGATE.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

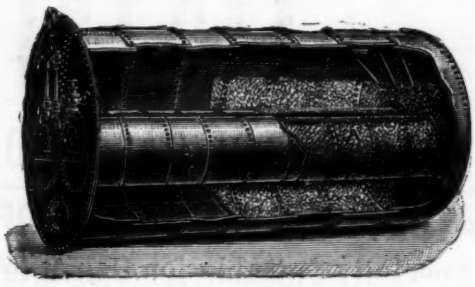
BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

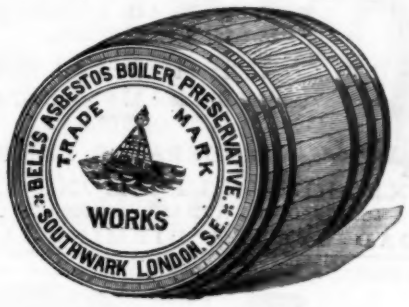
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. AMSTERDAM: 264, N. Z. Voorburgwal. BERLIN, BARCELONA, and ANTWERP.
AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. CARDIFF: BELL and Co., West Bute Street.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



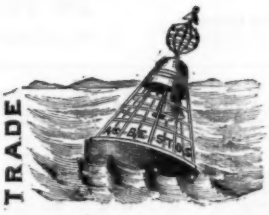
Every Cask is sent out as above.

The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.
MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street.
DUBLIN, BERLIN.



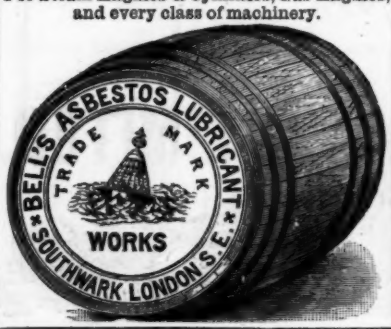
DEPÔTS.
AMSTERDAM: 264 N. Z. Voorburgwal,
BARCELONA, and ANTWERP.
AGENTS.
BIRMINGHAM: BELL and Co., 7, John Bright Street.
CARDIFF: BELL and Co., West Bute St

SOUTHWARK, BELL'S ASBESTOS. **LONDON, S.E.**

BELL'S ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



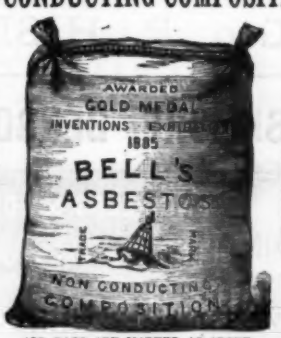
BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.

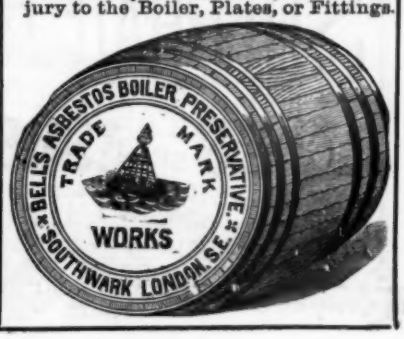
BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation and saves 40 per cent. of fuel. Is superior to any other, and save its cost in a few months.



Can be applied again after many years' service. Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



F. & C. OSLER,

(ESTABLISHED 1807)

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS.

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

CHANDELIERS IN BRONZE AND ORMOLU.

MODERATOR LAMPS.

100, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

Gas-Bags for Mains. High-Water Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpaulin Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber, and Stokers' Gloves.

Write for Price List to

THOMAS BUGDEN, Manufacturer,

116 & 118, GOSWELL ROAD, LONDON, E.C.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

PATENT GALVANIZED ROOFING.

Specially Suitable for Gas-Works.

G. R. HISLOP, Gas Engineer, Paisley, writes:—

"I have much pleasure in certifying entire satisfaction with your Patent Galvanized Arc Sheet Roofing with Steel Tube Joints, as supplied and erected by you here last autumn.

"While presenting a much more pleasing and substantial appearance, your system is in other respects more satisfactory than the ordinary Corrugated Iron; and such being the case, it is proposed to adopt it for other Roofs yet to be erected.

"*March* 5, 1890."

We contract to cover Buildings with our Patent Roofing on any Iron or Wood Framing, or supply and erect complete Buildings or Roofs.

Gas Engineers are invited to ask us for Plans and Estimates.

No Holes in these Sheets.
Always Water-Tight.

The Iron and Steel Fencing and Buildings Company, Limited,

109, ST. VINCENT STREET, GLASGOW,

Manufacturers of Tanks, Cisterns, & Fencing Material.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

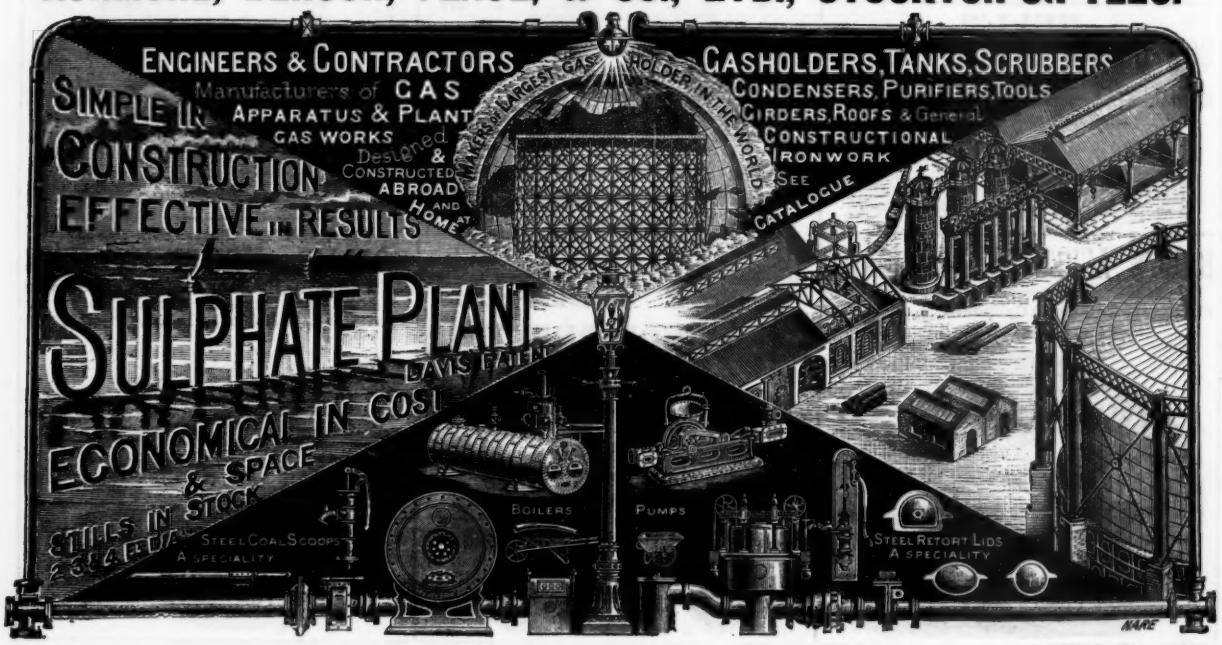
— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.



HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

And all classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

LONDON: 13, BILLITER STREET, E.C.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES

153 TO 155, CANNON STREET,

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ETNA WORKS,

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NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES

AND

MANUFACTURERS

OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

WEST'S GAS IMPROVEMENT Co., Ltd.,

Engineers, Ironfounders, & Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

Advantages attending its use are:—

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by WIRE ROPE, STEAM, or COMPRESSED AIR.—The power machines are applicable to circular, oval, or ⌂-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **Circular, Oval,** or ⌂-shaped **Mouthpieces,** with Morton's Self-Sealing Lids fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

Makers of THOMAS & SOMERVILLE'S COKE-BREAKING MACHINE.
Sole Makers of WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

— SPECIAL NOTICE. —

G. J. PARKINSON & Co.,

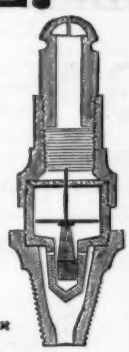
PENN STREET, CURZON STREET, BIRMINGHAM,

Have, from the 1st of January, 1890, commenced the supply of their

IMPROVED PATENT GAS GOVERNOR BURNER,

which cannot be surpassed by any other Burner in the market at the present time.

DO NOT MELT.



Please mention when required for Cannel Gas.

PRICE **14s.** PER DOZEN. *Trade Terms and further particulars on application.*

They will be pleased to supply a sample of their IMPROVED PATENT STREET LAMP GOVERNOR, *free of charge*, to Gas Companies, Corporations, and Municipal Authorities on application.

RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in. 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

FIRE BRICKS,

LUMPS, TILES,

BLOCKS, &c.

Special Bricks for Intense Heats.

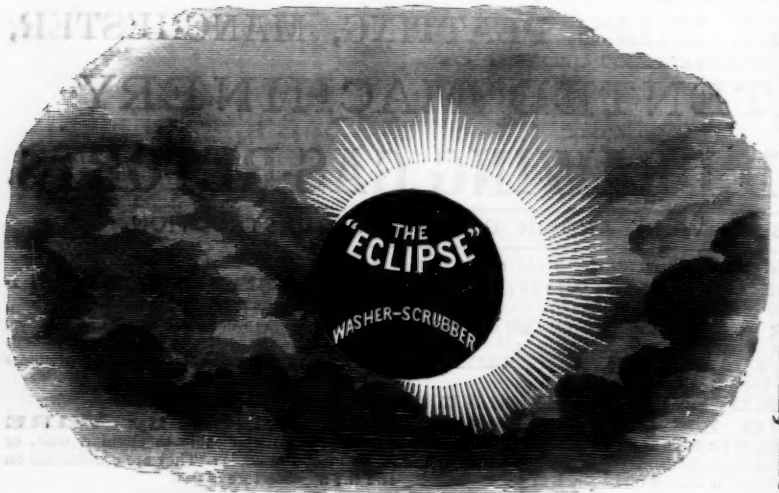
GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,

Fire-Brick Works, STOURBRIDGE.

☞ **Retort Setters sent to any part of the Kingdom.**



Laycock and Clapham's Patent.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas.

MACHINES with a total capacity of **42,500,000** cubic feet now working, and give great satisfaction.

LAST YEAR 11 Machines erected with a total capacity of **20,000,000** *feet.*

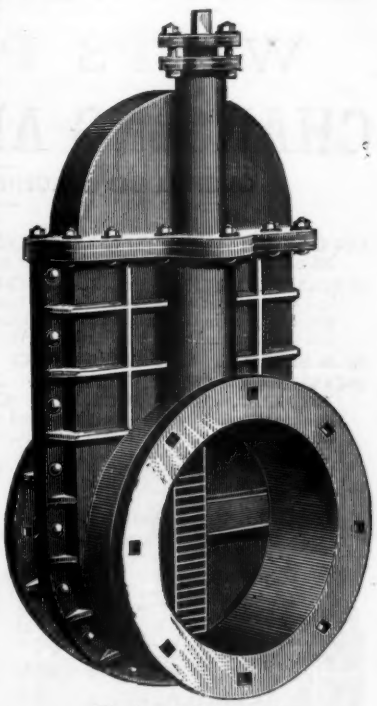
Send for Descriptive Catalogue to the Sole Makers:

Clapham Bros., Wellington, Nelson, & Market St. Works,

KEIGHLEY, YORKS.

Agents:—Mr. W. F. Roe, 52, Queen Victoria Street, E.C.
Mr. Maurice Schwab, 96, Deansgate, Manchester.
Mr. E. H. Wardwell, 10, Warren Street, New York, U.S.

SILVER MEDAL, Inventions Exhibition, 1885.



Clapham's Improved Internal Rack and Worm Valve, Gas-Mains, &c.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 24, 1890.